U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Astragalus microcymbus

Common Name:

skiff milkvetch

Lead region:

Region 6 (Mountain-Prairie Region)

Information current as of:

04/01/2011

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

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___ Taxon is more abundant or widespread than previously believed or not subject

___ Taxon not subject to the degree of threats sufficient to warrant issuance of

___ Range is no longer a U.S. territory

___ Insufficient information exists on biological vulnerability and threats to su

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats
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Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 07/30/2007

90-Day Positive:08/18/2009

12 Month Positive:12/15/2010

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Colorado
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Colorado
- **US Counties**: Gunnison, CO, Saguache, CO
- **Countries**:Country information not available

Land Ownership:

Bureau of Land Management (75 percent) and private (25 percent)

Lead Region Contact:

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Western Colorado ESFO, Gina Glenne, 970 243-2778 x 20, gina_glenne@fws.gov

Biological Information

Species Description:

Astragalus microcymbus is a perennial forb (a plant that can live to more than 3 years of age and without grass-like, shrub-like, or tree-like vegetation) that dies back to the ground every year. The plant has slender stems that are sparsely branched with dark green pinnate leaves, with 9–15 leaflets arranged in an evenly spaced fashion along either side of a central axis. It is in the pea (Fabaceae) family. The spindly red to purple branches grow from 30–60 centimeters (cm) (12–24 inches (in.)) long to 30 cm (12 in.) high, and may trail along the ground, arch upwards, or stand upright, often being supported by neighboring shrubs. Flowers are small (0.5 cm (0.2 in.)), pea-like, are found at the end of branches in clusters of 7–14 flowers, and have white petals that are tinged with purple. Fruits are boat-shaped (hence the common name "skiff" and the Latin name *microcymbus* meaning "small boat"), grow to less than 1 cm (0.4 in.), are triangular in cross-section, and hang abruptly downward from the branches. These characteristics, particularly the plant's diffuse branching, small white-purple pea-like flowers, and boat-like fruit pods distinguish this species from other *Astragalus* species in the area (description adapted from Peterson *et al.* 1981, pp. 5–7; Heil and Porter 1990, pp. 5–6; Isley 1998, p. 349).

Taxonomy:

The *Astragalus* genus is large, with over 1,500 species that are found on all continents except Antarctica and Australia, and with almost 600 species in the United States, primarily in the West (Isley 1998, p. 149). The genus is divided into many sections. *A. microcymbus* is not similar in appearance to other *Astragalus* species in the region. Its presumed closest relative (from the Strigulosi section of *Astragalus*) is found in New Mexico, with other relatives extending southward, and being found mostly in Mexico (Barneby 1964, p. 193; Isley 1998, pp. 349–350). The taxonomic status of *A. microcymbus* has not been disputed, although the monophyly (all members descended from a single common ancestor) of the Strigulosi section, and the placement of *A. microcymbus* within the section has been debated (Spellenberg 1974, pp. 394–395; Heil and Porter 1990, pp. 12–13). For the purposes of this candidate notice of review, we consider *A. microcymbus* to represent a valid species and, therefore, a listable entity.

Habitat/Life History:

Astragalus microcymbus individuals live on average 2–3 years (with a range of 1–16+ years). Most frequently, plants are alive for only 1 year (Denver Botanic Gardens [DBG] 2011, p. 5). The plant flowers from mid to late May into July (Heil and Porter 1990, p. 18; Japuntich 2010a, pers. comm.). There are more flowering plants in early June than at any other time, and flowering then drops off or stops, with a second bloom occurring in July (Japuntich 2010a, pers. comm.). The earlier flowering plants are reportedly larger and more vine-like, and later flowering plants are much smaller sized and less vine-like (Japuntich 2010a, pers. comm.).

Little is known of how *Astragalus microcymbus* reproduces. For example, we do not know if the plant requires pollinators, or what pollinators are important for reproduction. A single plant that was caged in 1980 did not produce fruit (Heil and Porter 1990, p. 18). Although this was suggested as evidence that the plant may require pollinators, we believe that this speculation is premature, because the study was completed for only one individual. Studies of other *Astragalus* species have found some species to be totally reliant on pollinators, and others to be somewhat self-compatible (able to produce seed without pollen from a different plant) but still relying on pollinators to some degree (Karron 1989, p. 337; Kaye 1999, p. 1254). *Astragalus* species with limited ranges are somewhat more self-compatible than wider ranging relatives (Karron 1989, p. 337).

Several pollinators have been observed visiting *Astragalus microcymbus*, suggesting that pollinators may be important for reproduction, but little is known about what pollinators these are (with the exception of the two listed below) and which are most important. Two insects that regularly visit the flowers of A. microcymbus were collected in 1989 (Heil and Porter 1990, pp. 18–19). One visitor was a small, black carpenter bee, *Ceratina nanula* that was collected from 3 sites (Heil and Porter 1990, pp. 18–19), and is known from at least 11 western States (Discover Life 2010, p. 1). The other visitor was a small, yellow and brown satyr butterfly, *Coenonympha ochracea* ssp. *ochracea*, a species of the Rocky Mountains (Heil and Porter 1990, p. 19). We expect there are more pollinators than these two species, based on the limited number of observations and collections to date (Heil and Porter 1990, pp. 6, 18-19; Sherwood 1994, p. 12), and because other *Astragalus* species are visited by many different pollinator species (Karron 1989, p. 322; Kaye 1999, pp. 1251–1252; Sugden 1985, p. 303).

Fruits of *Astragalus microcymbus* have been observed as early as late-May, are always present by mid-June, with peak fruiting occurring in mid-July, and all fruits falling off the plants by late-August (Heil and Porter 1990, p. 18). Fruit production varies greatly. For example, during a life-history study (discussed in further detail in Distribution and Abundance below), no fruits were counted in 2002, and 33,877 fruits were counted in 2008 (DBG 2010a, p. 5; DBG 2011, p. 19). In the same 16-year life history study (1995–2011), fruit production was high in only 4 years: 1995, 1997, 2008, and 2009 (DBG 2011, p. 19). This type of synchronous seeding is sometimes referred to as mast seeding or mast years. Mast seedings may be a strategy to release enough seeds to feed seed predators, that are kept at lower numbers in years with little or no seed production, while still allowing other seeds to germinate. Alternatively, it may be a product of increased pollination success (Crone and Lesica 2004, p. 1945). Fruit production is highest when the number of plants with above-ground growth is highest (DBG 2011, p. 6). Fewer fruits are produced with higher maximum temperatures from March through July. Increased rainfall in August of the previous year results in significantly fewer fruits the following season. And, increased rainfall during May, just prior to flowering leads to increased fruit production (DBG 2011, p. 6). In addition, the number of fruits produced is reduced as browsing increases (DBG 2011, pp. 6-7).

Seed dispersal mechanisms have not been researched, but wind and rain are considered candidates (Heil and Porter 1990, p. 19). Seed dormancy, seed survival, and seed longevity in the soil are unknown. We do not know if specific cues (e.g., temperature, precipitation, or seed coat alterations) are needed to break seed dormancy. Seed bank studies for other *Astragalus* species indicate that the group generally possesses hard impermeable seed coats with a strong physical germination barrier. As a result, the seeds are generally long-lived in the soil, and only a small percentage of seeds germinate each year (summarized in Morris *et al.* 2002, p. 30). Conversely, the DBG looked at soil cores taken from *A. microcymbus* monitoring sites and found only one seed. The authors concluded that *A. microcymbus* does not have an active seed bank (DBG 2010a, p. 6; DBG 2011, p. 7). More research is needed to better understand the seed bank's role in the life history of the species.

Astragalus microcymbus individuals may exhibit prolonged dormancy (remaining underground throughout a growing season). This trait may help a species better cope with drought or resource-limiting conditions (Lesica and Steele 1994, pp. 209–210). Between 7 and 63 percent of *A. microcymbus* individuals are dormant in a given year (DBG 2011, p. 18). Dormancy varies significantly from year to year and between plots (DBG 2011, p. 18). Of the individuals that exhibited prolonged dormancy, 54 percent remained dormant for 1 year, 10 percent were dormant for 2 years, with a decreasing percentage of individuals remaining dormant for each successively longer time period to 11 years (DBG 2008, p. 6). These numbers for prolonged dormancy are not definitive because researchers are unable to say with certainty if a plant returning to a spot where an individual was previously found is a new individual or an individual returning from prolonged dormancy (DePrenger-Levin 2010a, pers. comm.). Larger annual maximum monthly temperatures (and especially maximum temperatures in April) result in more dormant individuals and higher annual moisture (and especially higher precipitation in April) results in fewer dormant individuals (DBG 2011, p. 6).

Astragalus microcymbus is found in the sagebrush steppe ecosystem at elevations of 2,377–2,597 meters (m) (7,800–8,520 feet (ft)). The plant is most commonly found on rocky or cobbly, moderate to steep (9–38 degrees) slopes of hills and draws (Heil and Porter 1990, p. 16), although there are some sites that are flat. Plants are generally found on southeast to southwest aspects, but are occasionally found on northern exposures (Heil and Porter 1990, p. 13). The average annual precipitation is around 25 cm (10 in.) a year, and is fairly consistently spread across the year, except for July and August when roughly twice the precipitation falls compared to the other months (WRCC 2010a, pp. 3, 8). Snow falls in the winter and remains on the ground from November/December through March/April (WRCC 2010a, pp. 3, 8). Winters are cold with an average daily high in January of -3 °C (26.5 °F) and an average daily low of -20 °C (-4.0 °F). Summers are warmer. July is the hottest month with an average daily high of 27 °C (81 °F) and an average daily low of 6 °C (44 °F) (WRCC 2010b, pp. 3–8).

Astragalus microcymbus is found in open park-like landscapes dominated by several sagebrush species, cacti, sparse grasses, and other scattered shrubs. Shrubs are primarily represented by *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush), *Artemisia tridentata* ssp. *wyomingensis* (Wyoming sagebrush), *Artemisia frigida* (fringed sagebrush or prairie sagewort), and *Artemisia nova* (black sagebrush); yucca and cacti include *Yucca harrimaniae* (Spanish bayonet), and *Opuntia polyacantha* (plains pricklypear); grasses most commonly include *Achnatherum hymenoides* (formerly *Oryzopsis hymenoides*–Indian ricegrass), *Elymus elymoides* (formerly *Sitanion hystrix*–squirreltail), *Hesperostipa comata* (formerly *Stipa comata*–needle and thread grass), and *Poa* sp. (fescue); and the most common forbs include *Cryptantha cinerea* (James' Cryptantha) and *Penstemon teucrioides* (germander beardtongue). Other shrubs and small trees found within *A. microcymbus'* habitat include *Ribes cereum* (wax currant), *Symphoricarpos oreophilus* (mountain snowberry), and *Juniperus scopulorum* (Rocky Mountain juniper).

Soils are well drained and vary from sandy to rocky, but are primarily a thin cobble-clay loam (Heil and Porter 1990, p. 13). The primary soils within *Astragalus microcymbus* units are stony rock land (46 percent), Lucky-Cheadle gravelly sandy loams with 5–45 percent slopes (39 percent), alluvial land (8 percent), and Kezar-Cathedral gravelly sandy loams with 5–35 percent slopes (4 percent) (Natural Resource Conservation Service (NRCS) 2008; Service 2010a, pp. 12–13). Geologically, *A. microcymbus* is associated with: (1) felsic and hornblendic gneiss (metamorphic from igneous) substrates; (2) granitic (igneous) rocks of 1,700 million-year age group; and (3) biotitic gneiss, schist, and migmatite (sedimentary) substrates with 52, 37, and 11 percent, respectively, in each geology (Knepper *et al.* 1999, pp. 21–22; Service 2010a, pp. 10–11).

The areas where *Astragalus microcymbus* are found are generally distinct from surrounding habitats. They are more sparsely vegetated, drier than surrounding areas, more heavily occupied by cacti, and appear to have some specific soil properties as described above. This habitat is limited and patchily distributed on the landscape.

Historical Range/Distribution:

Astragalus microcymbus was discovered in 1945 by Rupert Barneby roughly 6 kilometers (km) (4 miles (mi)) west of Gunnison, Colorado (Barneby 1949, pp. 499–500). The species was not located again until 1955 by the Colorado botanical expert William Weber, who originally considered it to be nonnative because of its dissimilarity to the other numerous *Astragalus* species in the region (Barneby 1964, p. 193). Both of these early collections were from alongside Highway 50 near Gunnison, Colorado, at a location that has likely been destroyed. The plant was not located in its more intact and native habitat along South Beaver Creek until Joseph Barrell rediscovered the species in 1966 (Barrell 1969, p. 284; Colorado Natural Heritage Program (CNHP) 2010a, p. 14).

Given that *Astragalus microcymbus* was not discovered until 1945 and not located outside the type locality until 1966, it is difficult to know what the historical range of the species was. Only one site, the type locality, is considered historic, because the site has not been seen in over 20 years (since 1985). This site was partially searched (because of private land access) in 1994 when plants were not relocated, and there have not been subsequent visits. Otherwise, the historic range, as far as we know, is similar to the current range discussed below.

Current Range Distribution:

We use several terms to discuss various sizes or groupings of *Astragalus microcymbus* individuals: Element

Occurrence, site, polygon, point, and units. We consider the term Element Occurrence synonymous with population and it is further defined below. Within a population, various smaller "sites" have been hand drawn on maps between 1955 and 1994, and counted or tracked by site. To distinguish these older sites from more recent Global Positioning System (GPS) mapping efforts, we have used the term "polygon" (circles around clusters of individuals) or "point" (points representing one or a few plants within the immediate area) to describe data that was collected after 2003 with a GPS unit. Finally, we have taken the polygons and points and created "units" on which to conduct our spatial analyses for this candidate notice of review. The reasons for creating these units are described in further detail below.

The Colorado Natural Heritage Program (CNHP), the agency that tracks rare plant species in the State of Colorado, operates within the national NatureServe network and follows NatureServe protocols. NatureServe guidelines on designating Element Occurrences state they are to be designated to best represent individual populations, and are typically separated from each other by barriers to movement or dispersal (NatureServe 2002, p. 11).

Astragalus microcymbus has a very limited range. It is found in an area roughly 5.6 km (3.5 mi) from east to west and 10 km (6 mi) from north to south with a small, disjunct (widely separated) population found 17 km (10.5 mi) to the southwest on Cebolla Creek (Figure 1). The species is known primarily from Gunnison County with one site located in Saguache County. The majority of sites and individuals are along South Beaver Creek just southwest of Gunnison, Colorado. The species occurs on lands managed by the Bureau of Land Management (BLM) Gunnison Resource Area and adjacent private lands. Within known areas, *A. microcymbus* has a spotty distribution, most likely linked to the habitat being spotty on the landscape (Heil and Porter 1990, p. 16). Using the highest counts across years and across all sites, we estimate the total maximum historic population to be around 20,500 individuals in 5 populations (Table 1; Service 2011a, pp. 1–4). However, more recent counts indicate there are substantially fewer individuals than this today (DBG 2010a, p. 7; BLM 2010, p. 3). We estimate *A. microcymbus* occupied roughly 34 hectares (ha) (83 acres (ac)) in 2008 (BLM 2010, pp. 8–10). In previous estimates based on the hand-drawn maps, *A. microcymbus* occupied roughly 131 ha (324 ac) (CNHP 2010a).

TABLE 1. Summary of *Astragalus microcymbus* populations (Element Occurrences) (Service 2010b, pp. 1–4).

Population Name	Population #	# of Sites (pre-2004)	Estimated # of Individuals	Ownership	Population Rank
Beaver Creek SE	9	unknown	25	private	Historic
Henry	10	1	513	BLM	B
Gold Basin Creek	1	4	5,618	BLM	A
South Beaver Creek	2	39	14,317	BLM/private	A
Cebolla Creek	none	1	unknown	private	C or D
Total		45	20,473		

Population rankings are categorized from A through D, with "A" ranked occurrences generally representing higher numbers of individuals and higher quality habitat, and "D" ranked occurrences generally representing lower numbers of individuals and lower quality (or degraded) habitat. A historic rank (H) indicates an occurrence that has not been visited for more than 20 years.

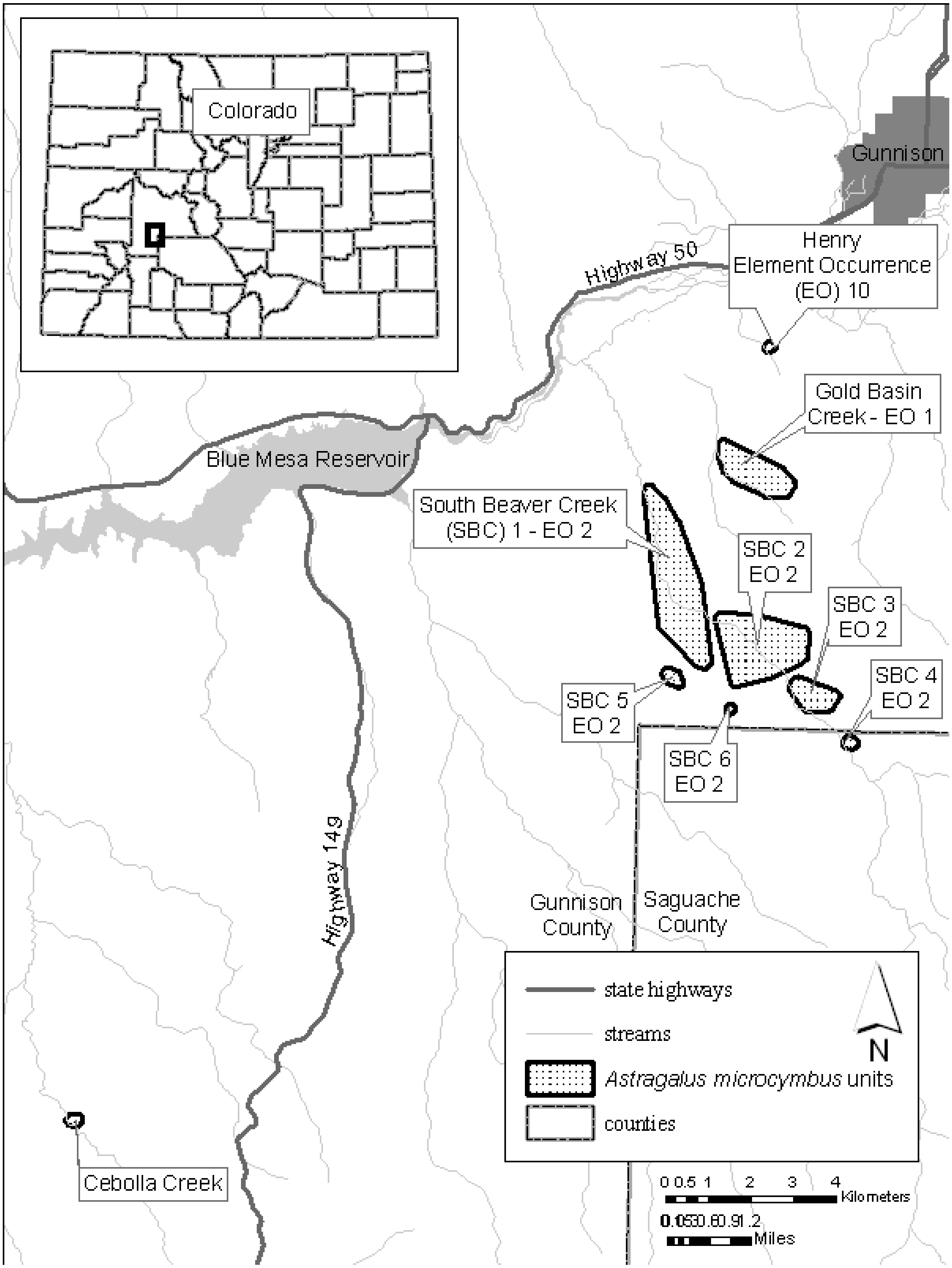

FIGURE 1. Current distribution of *Astragalus microcymbus* (BLM 2010, pp. 7-10; DePrenger-Levin 2010b, pers. comm.; 2010c, pers. comm.; 2010d, pers. comm.; Langton 2011, pp. 1-10).

The CNHP defines an Element Occurrence of *Astragalus microcymbus* as any naturally occurring population that is separated by a sufficient distance or barrier from a neighboring population. More specifically, for *A. microcymbus*, a population is separated by 1.6 km (1 mi) or more across unsuitable habitat, or 3.2 km (2 mi) across apparently suitable habitat (CNHP 2010b, p. 1). Given this definition, the CNHP has four populations of *A. microcymbus* in its database (CNHP 2010b, p. 2). Of these four populations, one (likely the type locality) has not been relocated since 1985 and is considered historic. This site was partially searched (because of private land access) in 1994 and not relocated, although there have not been subsequent visits. It is considered historic because it has not been seen in 20 years. The site along Cebolla Creek has not yet been incorporated into the CNHP's database, but when incorporated will comprise a separate population based on the separation distances described above.

While individuals of the species have been lost, we are unaware of the loss of any *Astragalus microcymbus* populations, although we are unsure of the status of Beaver Creek Southeast population since it has not been relocated in over 20 years. Two *A. microcymbus* populations comprise multiple sites (Gold Basin Creek and South Beaver Creek), and a few of these sites may have been extirpated (locally extinct). Site revisits using more accurate GPS mapping equipment from 2004–2008 generally re-located historical sites but decreased the overall footprint of most sites into smaller polygons and points. We roughly estimate the new mapping of polygons and points generally represents a reduction of about 75 percent in aerial extent from the original sites. We are unsure if the reduction of the site footprints is because of an actual contraction in the size of the sites, if the sites moved over time, or if it is an artifact of more precise mapping. We expect it may be a combination of all three. At three sites in the South Beaver Creek area, no plants were re-located despite several survey efforts; teh species may have been extirpated at these sites (Service 2011a; pp. 1–4; BLM 2010, pp. 7–10; DePrenger-Levin 2010b, pers. comm.). In an extreme example, one site along South Beaver Creek (023–033–31975), was reduced from a larger 4-ha (10-ac) site to two small polygons that are 97 percent smaller than previously mapped (Service 2011a; pp. 1–4; BLM 2010, pp. 7–10).

The lumping of sites into populations makes sense biologically because populations generally represent areas where genetic exchange is possible. However, past mapping efforts, site assessments, and count data have often been collected for smaller sites within a population (Service 2011a, pp. 1–4). The information gathered for these smaller sites is essential for tracking the status of the species but is somewhat problematic for an over-arching analysis for several reasons. First, the confusion between numbering protocols makes it difficult to ensure that particular counts, habitat specifics, or threats discussed by different sources are from the same sites. Second, mapping methodologies have resulted in varying delineations, especially with the advent of GPS technology.

For our analyses in this candidate notice of review, we evaluated the sites, polygons, and points within *Astragalus microcymbus* populations, and created what we call units from which to conduct our analysis. We did this for several reasons: (1) To simplify the problems associated with tracking sites (i.e., different sources used different descriptors, making it difficult to ensure that they were talking about the same site); (2) to more broadly characterize and analyze the threats to the species' habitat (we believe that sites, polygons, and points are too fine scale); (3) because the polygons mapped in 2008 were on average much smaller than the original hand-drawn sites, we wanted to include more of the potential or previously occupied habitat rather than restricting our analysis to the 2008 mapped polygons; and (4) to provide for a more detailed analysis than would occur if we were to look at populations. To designate the units, we drew a perimeter around all GPS-derived polygons and points that were within 200 m (656 ft) of one another, and then buffered each perimeter by an additional 100 m (328 ft) (Figure 1; Table 2). This 100-m (328-ft) buffer was included so that previously occupied habitat, as drawn on maps, fell within the boundaries of these units. As a result of this exercise, all of the sites within the Gold Basin Creek population were lumped. As shown in Figure 1 above, this methodology divided the South Beaver Creek population into six separate units. The Beaver Creek Southeast population, located entirely on private land, is not included in our units because we are unsure of its exact location and current existence.

TABLE 2. *Astragalus microcymbus* units for our spatial analysis in this candidate notice of review (Service 2011b, p. 1).

UNIT NAME	Population #	Est # of Individuals	Acres	Hectares	Ownership
Beaver Creek SE	9	25	Unknown	Unknown	private
Henry	10	513	15	6	BLM
Gold Basin Creek	1	5,618	347	140	BLM
South Beaver Creek 1	2	6,136	916	370	70% BLM, 30% private
South Beaver Creek 2	2	3,667	684	277	67 % BLM, 33% private
South Beaver Creek 3	2	2,464	163	66	99% BLM, 1% private
South Beaver Creek 4	2	778	24	10	25% BLM, 75% private
South Beaver Creek 5	2	1,232	40	16	BLM
South Beaver Creek 6	2	unknown	11	5	BLM
Cebolla Creek	none	unknown	25	10	13% BLM, 87% private
	TOTAL	20,433*	2,225	900	75% BLM, 25% Private

*Number is different from Table 1 above because the counts from two historical sites were excluded from the units.

Population Estimates/Status:

The CNHP assigns overall species ranks for rare plants within the State of Colorado. *Astragalus microcymbus* has a Global rank of G1 indicating the species is critically imperiled across its range, and a State rank of S1 indicating the species is critically imperiled within the State of Colorado (CNHP 2010b, pp. 1, 5). Since the species is known only from the State of Colorado, the State (S) and Global (G) ranks are the same.

Comprehensive surveys for *Astragalus microcymbus* were conducted in 1989 (BLM 1989a, pp. 1–31) and 1994 (Sherwood 1994, pp. 1–24). In 2008, the BLM conducted a comprehensive mapping effort without counts or population assessments (BLM 2010, p. 3). Several other efforts have counted individuals within certain sites (Japuntich 2010b, pers. comm.; DePrenger-Levin 2010b, pers. comm.; 2010c, pers. comm.; 2010d, pers. comm.; Service 2011a, pp. 1–4). Count data from various sites are difficult to compare because there is no way of knowing if two observers, during different years, travelled across similar areas, and if the effort between the two counts was similar. In general, counts in 1994 were higher than 1989 (Sherwood 1994, p. 13; Service 2011a, pp. 1–4). Several other observers have subsequently returned to these sites and found that *A. microcymbus* numbers in 2004, 2005, 2007, 2008, and 2010 were much lower than those of 1994 and the 1980s, with many sites shrinking from thousands to hundreds of individuals (DBG 2010a, p. 7; BLM 2010, p. 3; Service 2011a, pp. 1–4). Site counts and estimates from the 1980s and 1990s often reported the number of *A. microcymbus* individuals as more than 500, and sometimes as more than 2,000 individuals. Most counts in the last 5 years have been far less, generally under 150 individuals with only 1 count over 400 individuals (Service 2011a, pp. 1–4). Surveys in 2010 discovered several new sites. However, most were small with few individuals and all were within or very close to sites as they were mapped prior to GPS technology. Because of this close proximity or overlap, we have not changed the unit numbers of individuals to include the counts from 2010 (Service 2011a, pp. 1-4; Langton 2011, pp. 1-10) As a result of these surveys, the Gold Basin Creek unit increased in size 13 ha (32 ac) and the Henry unit increased in size 2 ha (4 ac) (Service 2011a, p. 1).

In 1989, the BLM developed a protocol to provide long-term trend data for selected populations of *Astragalus microcymbus* (BLM 1989b, pp. 1–4). They applied the protocol in select locations in 1990, 1994, and 2008. The number of individuals between 1990 and 2008 was not statistically different, and both years had similar low annual precipitation (20 cm (8 in.)) compared to the average of 25 cm (10 in.) (Service 2010c, pp. 1–8; DBG 2010a, p. 12; Western Regional Climate Center [WRCC] 2010c, pp. 1–8). However, there were significantly more plants in 1994 (three to four times) than either 1990 or 2008. Precipitation was higher in 1994, roughly 10 cm (4 in.) more than in 1990 or 2008 (WRCC 2010c, pp. 1–8). We conclude that there are more above-ground plants in years with more precipitation.

The DBG has been monitoring *Astragalus microcymbus* annually since 1995 (Carpenter 1995, pp. 1–7; DBG 2003, pp. 1–23; 2007, pp. 1–16; 2008, pp. 1–20; 2010a, pp. 1–17; DBG 2011, pp. 1-20). The DBG found a decline in the number of *A. microcymbus* individuals from 1995-2010 (Figure 2), especially from 1995–2002 (DBG 2010a, p. 5). When comparing the first year of monitoring to the last, this decline is not statistically significant because of a partial rebound in the last few years (DBG 2011, p. 5, 5). Dormant individuals are unknown for the first and last years of the study (1995 and 2008) because of problems associated with finding dormant individuals in the first year, and because dormant individuals cannot be distinguished from dead individuals in the last year.

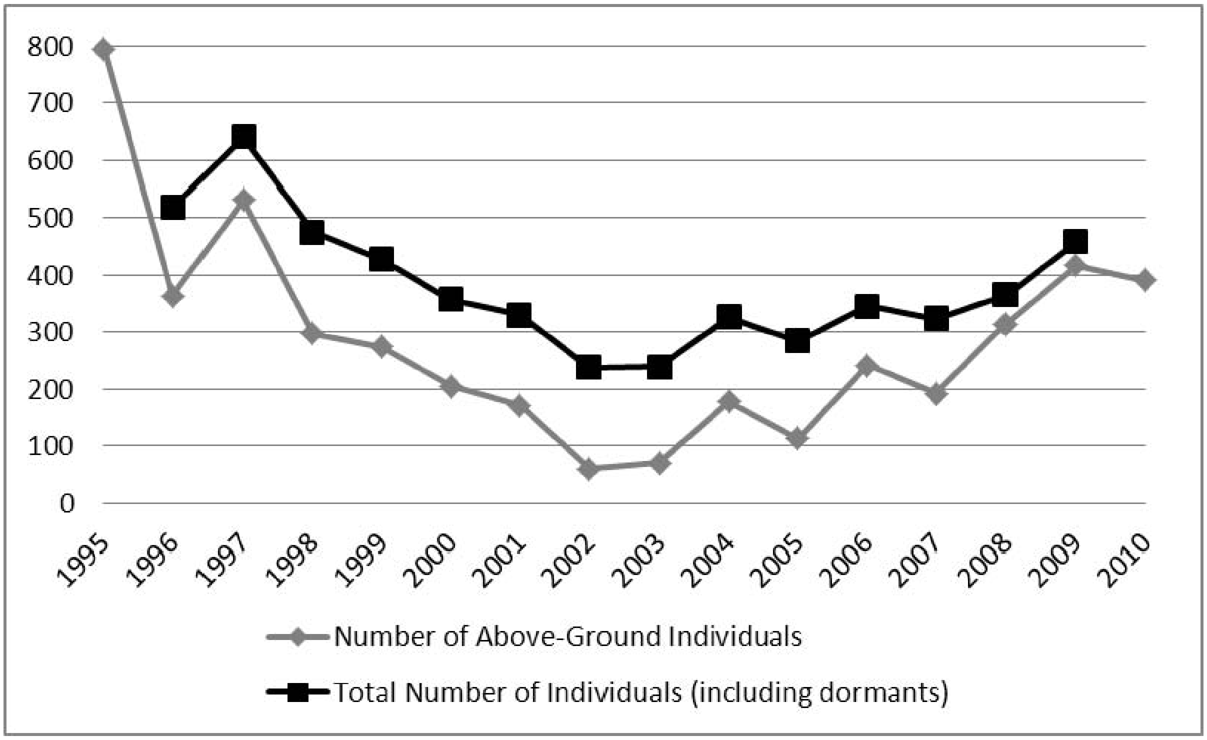

FIGURE 2. Total number of above-ground *Astragalus microcymbus* individuals from 1995-2010, and total number of above-ground and dormant *A. microcymbus* individuals from 1996-2009. Both are summed across four plots (DBG 2011, p. 18).

In conjunction with the life-history monitoring, the DBG has conducted a population viability analysis using data from 1995–2010. They found that all monitored populations of *Astragalus microcymbus* were in decline, and predicted that all populations will comprise 1 individuals or less (their definition of extinct) within 50 years (DBG 2011, p. 15).

Astragalus microcymbus total numbers of individuals are positively correlated with spring precipitation, with May precipitation showing the most influence (DBG 2011, p. 6). Warmer maximum temperatures in the spring resulted in fewer individuals with above ground growth (DBG 2011, p. 6). The number of individuals with above ground growth is correlated with maximum temperatures in March and June and rainfall in January, March, and the previous August, November, and December (DBG 2011, p. 6).

Survey efforts, trend monitoring, life-history monitoring, and the corresponding population viability analysis all suggest that *Astragalus microcymbus* numbers are declining. In both of the more rigorous monitoring efforts, the decline seems to be correlated with precipitation. The drought in the early 2000s caused a huge decline in numbers, with a rebound in the later 2000s (DBG 2010a, p. 5). However, the very low survey numbers from this decade as compared to the 1980s and 1990s seem less correlated with precipitation (Service 2011a, pp. 1–4; WRCC 2010c, pp. 1–8). The reasons for these declines are not fully understood.

Distinct Population Segment(DPS):

Not applicable.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or

range:

The following potential factors that may affect the habitat or range of *Astragalus microcymbus* are discussed in this section, including: (1) Residential and urban development; (2) recreation, roads, and trails; (3) utility corridors; (4) nonnative invasive plants; (5) wildfire; (6) contour plowing and nonnative seedings; (7) livestock, deer and elk use of habitat; (8) mining, oil and gas leasing; (9) climate change; and (10) habitat fragmentation and degradation.

Residential and Urban Development

The majority of *Astragalus microcymbus* is located between 3.2 and 11 km (2 and 7 mi) of the town of Gunnison, Colorado, the largest town in Gunnison County (Figure 1). Rapid population growth in the rural Rocky Mountains, including the Gunnison area, is being driven by the availability of natural amenities, recreational opportunities, aesthetically desirable settings, grandiose viewscapes, and perceived remoteness (Riebsame 1996, pp. 396, 402; Theobald *et al.* 1996, p. 408; Gosnell and Travis 2005, pp. 192–197; Mitchell *et al.* 2002, p. 6; Hansen *et al*. 2005, pp. 1899–1901). Gunnison County grew from 5,477 people in 1960 to 15,048 people in 2007, constituting a 300 percent increase in population in less than 50 years (CensusScope 2010, pp. 1–3; Colorado State Demography Office 2008, p. 1). The population of Gunnison County is predicted to more than double by 2050 to approximately 31,100 residents (Colorado Water Conservation Board 2009, p. 53).

Human population growth results in increased fragmentation of habitat (see Factor E below) (Theobald *et al.* 1996, pp. 410–412), increased recreation and more roads (see Recreation, Roads, and Trails below) (Mitchell *et al*. 2002, pp. 5–6; Hansen *et al.* 2005, p. 1899), more utility corridors (see Utility Corridors below), more nonnative invasive plants (see Nonnative Invasive Plants below) (Hansen *et al.* 2005, p. 1896), and changes to ecological processes (Hansen *et al.* 2005, p. 1901). A recent but common pattern of population growth in the Gunnison area is “exurban” or “ranchette” development. These ranchettes consist of larger lots (generally more than 14 ha (35 ac)) each with an isolated large house. This type of development, because of its location outside of urban footprints, may have more impacts to ecosystems and biodiversity than urban or urban fringe development (Hansen *et al.* 2005, p. 1903). Much of this development occurs on steeper slopes, like those where Astragalus microcymbus is found, where views are better.

To the best of our knowledge, residential and urban development (aside from roads) has impacted only one *Astragalus microcymbus* unit: the Beaver Creek Southeast Unit. The original type locality along Highway 50 may have been lost to highway activities, and the nearby private lands where the plant was located in the late 1970s and early 1980s may have been lost to a gravel pit (Sherwood 1994, pp. 18–19). No more than 30 plants were reported from this unit in any given year from 1955–1994 (Service 2011a, p. 1). Only two *A. microcymbus* sites are near buildings: There is a cabin near one of the larger *A. microcymbus* sites within the South Beaver Creek 1 Unit (BLM 1989a, p. 31), and there is a house within the Cebolla Creek Unit. We do not know if construction of either of these structures impacted *A. microcymbus*.

Twenty-five percent of the *Astragalus microcymbus* units are on private land, mostly along South Beaver Creek (Table 2). Five parcels of private land (with an additional parcel nearby) are currently within *A. microcymbus* units along South Beaver Creek ranging in size from 17 to 263 ha (43 to 650 ac), only one of which has any housing or agricultural developments. All of these parcels are used primarily for livestock ranching operations that have a much lower impact to the plants than urban or residential development.

These private land parcels bisect the South Beaver Creek 1 and South Beaver Creek 2 Units, and clip portions of the South Beaver Creek 3 and South Beaver Creek 4 Units (Service 2011b, pp. 2–3). Roughly half of the known *Astragalus microcymbus* individuals are within the South Beaver Creek 1, 2, and 4 Units (Table 2), making them especially important to the conservation of the species. These three units all have at least 30 percent of their area on private lands (Table 2), more than the average across the units of 25 percent. Given their proximity to town, the rapid growth predicted for Gunnison County (Colorado Water Conservation

Board 2009, p. 53), the lack of undeveloped parcels in desirable locations (Gunnison County 2005, p. 1), and their appealing views, these parcels are in a likely location for development and could be subdivided in the future. In addition, the Cebolla Creek Unit is located almost entirely on private land and is already partially developed.

Residential or urban development of these parcels would likely lead to the destruction of *Astragalus microcymbus* individuals, as well as fragment and alter the plants' habitat. In 2005, it was estimated that only 30 percent of the private lands in Gunnison County remained undeveloped (Gunnison County 2005, p. 1). Because only 30 percent of the private lands in Gunnison County remain undeveloped, and because the population of Gunnison County is expected to double by 2050, we conclude that the currently undeveloped private lands where *A. microcymbus* occurs are likely to be developed by 2050. The potential loss of up to 25 percent of the area (habitat) and even more of the individuals of *A. microcymbus* is a significant threat for a species with such limited numbers and a limited range (Table 2). This development also would fragment the habitat, potentially isolating small populations from one another leading to the further loss of individuals.

Currently, the impact of development on the species is relatively minor, consisting of the few examples provided above. Although 25 percent of *Astragalus microcymbus* individuals are on private lands with no protective mechanisms in place for the species, little development is currently occurring on these private lands. However, we believe that the threat of development to the species may increase in the foreseeable future based on future human population growth. Future development on these lands is likely, because of the rate of growth in the Gunnison area. Given that Gunnison County has seen a 300 percent increase in population in less than 50 years, that only 30 percent of the private lands remain undeveloped, and *A. microcymbus'* close proximity to the town of Gunnison, we expect that some of these private land parcels will be developed in the next several decades. Based on the population projections presented above, the foreseeable future for development is 40 years, as the population of Gunnison County is predicted to more than double by 2050. Based on the above information, we consider residential and urban development to be a threat to the species in the foreseeable future.

Recreation, Roads, and Trails

It is difficult to separate the effects of roads and trails from the effects of recreation where *Astragalus microcymbus* resides. Most forms of recreation within *A. microcymbus'* range include the use of roads and trails either as a form of recreation (e.g., vehicle use, mountain biking, or hiking) or as a way to access recreation areas (e.g., target shooting and rock climbing areas). For these reasons, we have chosen to address recreation, roads, and trails together in this section.

Roads cause habitat fragmentation because they create abrupt transitions in vegetation; add edge to adjacent patches; are sources of pollutants; and act as filters (allowing some species to cross but not others) and barriers (prohibiting movement) (Spellerberg 1998, pp. 317–333). Road networks contribute to exotic plant invasions via introduced road fill, vehicle transport of plant parts, and road maintenance activities (Forman and Alexander 1998, p. 210; Forman 2000, p. 32; Gelbard and Belnap 2003, p. 426). Many of these invasive species are not limited to roadsides, but also encroach into surrounding habitats (Forman and Alexander 1998, p. 210; Forman 2000, p. 33; Gelbard and Belnap 2003, p. 427).

Aside from the indirect effects discussed above, a road typically removes all vegetation from about 0.7 ha (1.7 ac) per 1.6 km (1 mi), while a single track trail removes all vegetation from about 0.1 ha (0.25 ac) per 1.6 km (1 mi) (BLM 2005a, p. 13). Roads also act as corridors that facilitate human interaction with species and increase the opportunities and the likelihood of travel across undisturbed (non-road) areas. The recreational use of roads is on the rise. From 1991 to 2006, off-highway vehicle registrations increased 937 percent (from 11,744 to 109,994 within the state), with an average annual increase of 16 percent (Summit County Off Road Riders 2009, p. 1). Recreational activities within the Gunnison Basin are widespread, occur during all seasons of the year (especially summer and hunting season), and have expanded as more people move to the area or come to recreate (BLM 2009a, pp. 7–8). Motorized and mechanized use has been increasing within the Gunnison Basin and is expected to increase in the future based on increased population (U.S. Forest Service [USFS] and BLM 2010, p. 5, 9, 85, 124–125, 136, 158, 177, 204, 244, 254, 269, 278).

Because *Astragalus microcymbus* generally occurs on slopes, it is somewhat protected from the further development of large roads. Many of the existing roads, although not all, run immediately along the bottom or top of sites instead of through the middle of sites. However, these slopes appear to be the preferred location for dirt bike and mountain bike trails, especially those that were user-created instead of formally designed. Many of the trails within the range of *A. microcymbus* are user-created and run across or up through the slopes where the plant is found (Service 2010, pers. comm.). These user-created trails, when redesigned, often require a series of switchbacks, which could increase the opportunity for impacts to the plant. Travel management (the allocation and use of motorized and nonmotorized use), and route designation and design, both within the Hartman Rocks Recreation Area and outside that area, are described in further detail below.

Except for the one disjunct population, all of the *Astragalus microcymbus* units are within 11 km (7 mi) of the town of Gunnison, the closest of which is 3.2 km (2 mi) away. This close proximity to an urban area makes the species more susceptible to recreational impacts than if it were located more remotely. The Hartman Rocks Recreation Area is a popular urban interface recreation area and contains roughly 40 percent of the A. microcymbus units (BLM 2005a, p. 3; Service 2010a, pp. 4–5). The Hartman Rocks Recreation Area is located between 3 and 10 km (2 and 6 mi) from the town of Gunnison on BLM lands (BLM 2005a, p. 3). The Hartman Rocks Recreation Area covers 3,380 ha (8,350 ac), but trails expand out onto adjacent lands. These lands also have *A. microcymbus* plants and habitat that are being impacted by these trails (BLM 2005a, p. 3).

We have no detailed information on how much use occurs, how this use is increasing, or when the use is occurring in the Hartman Rocks Recreation Area. In 2005, it was estimated that the Hartman Rocks Recreation Area received 15,000–20,000 user days each year (BLM 2005a, p. 3). Recreation activities within the Hartman Rocks Recreation Area include mountain biking, motorcycling, all-terrain vehicle riding, 4-wheeling, rock climbing, camping, trail running, horseback riding, cross country skiing, snowmobiling, dog sledding, hill parties, target shooting, hunting, paintball, and more (BLM 2005a, p. 3). We have seen most of these activities occurring adjacent to or within *Astragalus microcymbus* sites (Service 2010, pers. comm.).

The BLM's Hartman Rocks Recreation Management Plan closed two trails and rerouted one trail to protect *Astragalus microcymbus* (BLM 2005a, p. 18; Japuntich 2010c, pers. comm.). These closures were for trails that were directly impacting *A. microcymbus* individuals. The Aberdeen Loop trail goes very close to several *A. microcymbus* sites within the South Beaver Creek 1, South Beaver Creek 5, and South Beaver Creek 6 Units. To protect Gunnison sage-grouse brood-rearing habitat, this trail was reconfigured (BLM 2011, p. 3). The reconfiguration was placed to minimize impacts to *A. microcymbus* although the actual number of individuals impacted by the reroute is unknown. Large sections of the old trail were rehabilitated to minimize future use (BLM 2011, p. 3). Many trails are open year-round in the Hartman Rocks Recreation Area, but with less use in the winter and early spring when trails are snow covered or muddy. Closures during *A. microcymbus'* growing season (likely late April through August) would benefit the species by reducing impacts to seedlings and plants, and by lessening disruptions to pollinators. The Aberdeen Loop trail that runs through the South Beaver Creek 1, South Beaver Creek 5, and South Beaver Creek 6 occupied *A. microcymbus* habitat has been subject to seasonal closures for the Gunnison sage grouse from June 15 until August 31. These closures provide partial protection for *A. microcymbus* in the growing season. Given that this trail has been rerouted we are unsure whether the seasonal closure remains. The BLM has begun working on an update to the Hartman Rocks Recreation Area Plan (BLM 2011, p. 3).

The South Beaver Creek Area of Critical Environmental Concern (ACEC) (also a Colorado Natural Area) was designated in 1993 by the BLM with the intent of protecting and enhancing existing populations of *Astragalus microcymbus* (BLM 1993, pp. 2.18, 2.29; Colorado Natural Areas Program [CNAP] 1997, pp. 1–7). The South Beaver Creek ACEC is 1,847 ha (4,565 ac), and includes 60 percent of the *A. microcymbus* units rangewide (BLM 1993, p. 2.18; Service 2010a, pp. 8–9). Seventy percent of the South Beaver Creek ACEC is within the Hartman Rocks Recreation Area, although the South Beaver Creek ACEC was developed at least 8 years prior to the Hartman Rocks Recreation Area (BLM 2005a, p. 44). Because of its designation as a recreation area, the Hartman Rocks Recreation Area draws users to the area, which is in conflict with the ACEC's intent to protect and enhance *A. microcymbus*.

When the South Beaver Creek ACEC was designated, motorized vehicle traffic was limited to designated routes, whereas it had previously been open on all lands (BLM 1993, p. 2.30). Outside the South Beaver Creek ACEC, all lands within the range of *Astragalus microcymbus* remained open to motorized vehicle traffic. In 2001, mechanized travel, including mountain bikes, on all lands within the Gunnison Resource Area including the South Beaver Creek ACEC and the Hartman Rocks Recreation Area was limited to designated routes (USFS and BLM 2001a, p. 3; 2001b, pp. 1–2; BLM 2005a, p. 14). This closure resulted in new protections for *A. microcymbus* from mountain bikes and vehicular use on BLM lands outside the South Beaver Creek ACEC, and from mountain bikes within the ACEC.

Enforcement of travel designations and trail closures is difficult given the large area of the BLM's Gunnison Resource Area and limited law enforcement personnel (USFS and BLM 2010, p. 259). Illegal trails are always an issue in well-used recreation areas (BLM 2010, p. 4). Furthermore, the open park-like habitat of *Astragalus microcymbus* makes it difficult to disguise trails that have been closed. Numerous undesignated trails running through A. microcymbus habitat are visible on satellite images (see below). Law enforcement with the Gunnison Resource Area is provided by the BLM's Montrose Area Office, which is located over 105 km (65 mi) away. Law enforcement within this area is intermittent, and tickets are rarely, if ever, issued for trespass use (USFS and BLM 2010, p. 259).

As an example, the Quarry Drop trail that runs through the South Beaver Creek 1 Unit was closed in 2005 with the Hartman Rocks Recreation Plan, because it ran directly through two *Astragalus microcymbus* sites (BLM 2010, p. 4). Although this trail is posted as closed, it was still in use during the summer of 2009, when rocks were placed to close the trail entrance (BLM 2010, p. 4). The Gunnison Trails group (a local non-profit trail-building group) and the BLM have increased their efforts on finding illegal trails and closing them before they become more established. Continued pressure from the recreation community for new trail construction is likely, as well as trespass use (BLM 2010, p. 4). In an effort to control illegal use, the BLM put up educational signs where roads enter the South Beaver Creek ACEC explaining what *A. microcymbus* is and why the species and its habitat are important to preserve (BLM 2010, p. 6). Trails that have been closed are planned to be rehabilitated where they meet open trails during the summer of 2011 in an attempt to ensure they will no longer be used (Japuntich 2010d, pers. comm.; BLM 2011, p. 3).

The BLM and the USFS finalized a joint Environmental Impact Statement for a Gunnison Basin Federal Lands Travel Management Plan that includes areas on BLM lands outside the Hartman Rocks Recreation Area (USFS and BLM 2010, pp. 1–288). This plan builds upon the Gunnison Travel Interim Restrictions of 2001 by closing additional routes, mostly for resource-related reasons (USFS and BLM 2010, p. 1). *Astragalus microcymbus* is not considered in detail in this plan, nor does the plan designate roads be closed specifically to protect *A. microcymbus* (USFS and BLM 2010, pp. 47, 78–79). None of the closures proposed in the plan will benefit *A. microcymbus* nor do they address routes within the Hartman Rocks Recreation Area.

We have found roads, trails, and gravel parking areas running through and even atop *Astragalus microcymbus* individuals and polygons (Service 2010, pers. comm.). These roads, trails, and parking areas generally have no vegetation, except along their margins. *A. microcymbus* individuals can be found along the margins of these roads, trails, and parking areas, sometimes with tire tracks atop (Service 2010, pers. comm.). Cheatgrass is spreading from the old road bed upslope and into the one site where invasion is occurring (Service 2010, pers. comm.). Trails sometimes are deeply incised and eroded (Service 2010, pers. comm.).

In 2010, we conducted a spatial analysis overlaying the distribution of *Astragalus microcymbus* units with designated routes within and near the Hartman Rocks Recreation Area. We found 8.8 km (5.5 mi) of roads (3.5 km (2.3 mi)) and trails (5.3 km (3.2 mi)) overlap with A. microcymbus units (Table 3) (BLM 2010; Service 2010a, pp. 14–15). Through this mapping effort, we found four of the polygons within the Gold Basin Creek Unit are being directly impacted by these roads and trails (Service 2010a, p. 16). We also are aware of at least three other polygons that are being directly impacted by roads and trails (Service 2010, pers. comm.). Estimating that a road typically removes all vegetation from about 0.7 ha (1.7 ac) per 1.6 km (1 mi) while a single track trail removes all vegetation from about 0.1 ha (0.25 ac) per 1.6 km (1 mi) (BLM 2005a, p. 13), in 2010, designated roads directly impacted 1.6 ha (3.9 ac) and designated trails directly impact 0.3 ha (0.8 ac) of habitat within *A. microcymbus* units.

TABLE 3. Roads, trails, and paths within *Astragalus microcymbus* units as of 2010. Designated routes are those included in the BLM's geospatial layers, undesignated are those located using satellite imagery.

	DESIGNATED		UNDESIGNATED			
UNIT NAME	Roads km (mi)	Trails km (mi)	Roads km (mi)	Trails km (mi)	Paths km (mi)	TOTAL km (mi)
Henry	0.1 (0.06)		0.1 (0.06)	0.1 (0.06)		0.3 (0.2)
Gold Basin Creek	2.2 (1.4)	1.4 (0.9)	0.1 (0.06)	0.4 (0.2)	1.3 (0.8)	5.4 (3.4)
South Beaver Creek 1	1.2 (0.7)	3.5 (2.2)	6.3 (3.9)	3.4 (2.1)	1.6 (1.0)	16.0 (9.9)
South Beaver Creek 2			2.4 (1.5)	0.3 (0.2)	3.6 (2.2)	6.3 (3.9)
South Beaver Creek 3			0.7 (0.4)			0.7 (0.4)
South Beaver Creek 4						
South Beaver Creek 5		0.2 (0.1)				0.2 (0.1)
South Beaver Creek 6		0.2 (0.1)				0.2 (0.1)
Cebolla Creek			0.6 (0.4)			0.6 (0.4)
TOTAL (km)	3.5 (2.2)	5.3 (3.3)	10.2 (6.4)	4.2 (2.6)	6.5 (4.0)	29.7 (18.5)

While travel is officially limited to designated routes only on BLM lands, there are numerous roads, trails, and paths that are not designated, with some receiving regular use. Some of these roads have been closed, but their footprint remains. Some of these roads are on private lands along South Beaver Creek, but many are trails or old roads on BLM lands that are undesignated, that either show evidence of use or could be receiving use. We used the NRCS' 2005 National Agriculture Imagery Program (NAIP) satellite imagery to look for roads, trails, and paths in occupied *Astragalus microcymbus* units additional to those BLM roads and trails included in the analysis above. We designated roads, trails, and paths based on the width of the disturbance. Roads were the widest, trails were narrower, and paths were the narrowest. In 2010, we found almost 21 km (13 mi) of additional roads, trails, and paths, including: 10.2 km (6.3 mi) of roads, 4.2 km (2.6 mi) of trails, 6.5 km (4.0 mi) of paths (Table 3) (Service 2010a, pp. 21–22). Using the BLM's estimates of direct impacts (BLM 2005a, p. 13), undesignated roads directly impact 4.4 ha (10.9 ac), undesignated trails directly impact 0.3 ha (0.8 ac), and undesignated paths directly impact less than 0.4 ha (1 ac) of *A. microcymbus* habitat. Because we were using satellite imagery, we cannot say for certain what the level of use is on the trails, or even say if they are still in use. Some of the paths may have been livestock trails. Livestock trails may receive more or less use than other trails, but the effects are likely similar.

All units except the South Beaver Creek 4 Unit have roads and trails. Designated and undesignated roads denude about 5.7 ha (14.1 ac), designated and undesignated trails denude about 0.6 ha (1.6 ac), and undesignated paths denude less than 0.4 ha (1 ac) within *Astragalus microcymbus* units, or less than 0.8 percent (Table 4). To estimate the indirect effects of roads and trails, we used a 20-m (66-ft) buffer on either side of roads and trails. This distance represents the area where invasive nonnative species are most likely to invade, pollinators may be impacted or disturbed by passing vehicles, off-trail use is most likely, and impacts from dust may occur. This distance results in a conservative estimate of impacts, as it is probably more accurate for trails than roads (summarized in DBG 2010b, p. 1). Using this buffer distance, we estimated in 2010 that roughly 14.5 percent of *A. microcymbus'* total habitat may currently be impacted by roads and trails (Table 4) (Service 2010a, pp. 23–25). We expect our 15-percent estimate is low. For example, plumes of dust are known to travel hundreds of meters, especially in arid climates (Gilles et al. 2005, p. 2346). Also, we expect that the two known pollinators of *A. microcymbus* travel at least 100 m (328 ft) from their nests, and impacts within this area could impact the nests of these pollinators (Greenleaf et al. 2007, pp. 589–596). In the case of the *A. microcymbus* site with cheatgrass, we estimate that the cheatgrass invasion was facilitated by the road and has since moved roughly 20 m (66 ft) upslope into the site (Service 2010, pers. comm.). A 100-m (328-ft) buffer (that would better account for indirect dust and invasive nonnative species effects) on either side of these roads and trails would cover roughly 46 percent of the A. microcymbus units.

TABLE 4. Direct and indirect (20 meter (66 foot)) effects to *Astragalus microcymbus* units from roads, trails, and paths in 2010.

UNIT NAME	ROAD km (mi)	TRAIL & PATH km (mi)	DIRECT AREA ha (ac)	DIRECT % of unit	20-m (66-ft) BUFFER AREA ha (ac)	20-m (66-ft) BUFFER % of unit
Henry	0.2 (0.1)	0.1 (0.06)	0.1 (0.2)	1.9	1.8 (4.6)	42
Gold Basin Creek	2.3 (1.4)	3.1 (1.9)	1.2 (3.0)	1	22.7 (56.0)	17.8
South Beaver Creek 1	7.5 (4.7)	8.5 (5.3)	3.8 (9.4)	1	69.7 (172.1)	18.7
South Beaver Creek 2	2.4 (1.5)	3.9 (2.4)	1.3 (3.2)	0.5	26.9 (66.3)	9.7
South Beaver Creek 3	0.7 (0.4)		0.3 (0.7)	0.4	3.2 (7.9)	4.8
South Beaver Creek 4						
South Beaver Creek 5		0.2 (0.1)	0.01 (0.02)	0.05	0.9 (2.2)	5.8
South Beaver Creek 6		0.2 (0.1)	0.01 (0.02)	0.2	0.9 (2.2)	19.4
Cebolla Creek	0.6 (0.4)		0.3 (0.7)	2.8	2.7 (6.8)	27.7
TOTAL (km)	13.7 (8.5)	16.0 (9.9)	6.9 (17.1)	0.8	128.7 (318.1)	14.5

Given the numerous roads and trails within *Astragalus microcymbus'* habitat (impacting between 15 and 46 percent of the units), the dispersed and bisecting nature of these roads and trails, the numerous trespass trails, the likely increase in nonnative invasive plants from road and trail use, and the fact that a recreation area was designated on 40 percent of the species habitat, we find the magnitude of the threat from recreation, roads, and trails to be high. The threat is ongoing with a high likelihood that it will continue to increase over time. Given that off-road vehicle use in Colorado is increasing 16 percent annually, that the population of Gunnison County is estimated to double by 2050, and that other recreational impacts also are increasing at a rapid pace, we expect a significant increase in the threat from recreation, roads, and trails in the next 40 years. The Hartman Rocks Recreation Area's Management Plan is applicable for 10–15 years from 1995, although there is no definitive expiration date (BLM 2005a, p. 7). The BLM has begun working on an update to this plan that will include rehabilitation plans and trail plans (possibly closures) in areas where the plant resides (BLM 2011, pp. 2-3). The most recent Travel Management Plan (USFS and BLM 2010, entire) for the Gunnison Basin will have a similar lifespan. During this time period travel management is not likely to change while we anticipate use will increase. Based on the above information, we consider recreation, roads, and trails to be a significant threat to the species now and in the foreseeable future.

Utility Corridors

Utility corridors have similar effects to habitats as roads because both are linear disturbances (see Recreation, Roads, and Trails above for a review of effects). The impact from a utility corridor is greater than its actual footprint, because utility corridors fragment habitat and facilitate the invasion of nonnative invasive plants. We are aware of one large electrical transmission line in *Astragalus microcymbus* habitat. The Curecanti to Poncha 230-kilovolt electrical transmission line bisects the South Beaver Creek 1 Unit and was built in 1962 (Japuntich 2010e, pers. comm.). A 500-foot right-of-way (ROW) (largely not disturbed) is on both sides of the power line (Japuntich 2010e, pers. comm.), which overlays with about 38 ha (94 ac) or 10 percent of the South Beaver Creek 1 Unit and 4 percent of the total area of all *A. microcymbus* units. Only a small proportion of the 500-foot ROW is disturbed. We estimate 1.2 km (0.75 mi) of transmission line with at least six large structures (power poles) within the unit. Given the close proximity of *A. microcymbus* individuals to the transmission line, we assume some individuals were impacted during construction. At least one access road to a power pole also provides vehicular access to an *A. microcymbus* site where plants are being impacted by vehicles driving on them. This transmission line is used recreationally by snowmobile riders in the winter (BLM 2005a, p. 53). We do not know if there are any impacts to *A. microcymbus* from these snowmobiling activities. Direct impacts seem unlikely from the snowmobiling because the plants are dormant and under snow when the use is occurring. However, compaction to the habitat is a possibility.

Future ROW developments are allowed in the South Beaver Creek ACEC provided that the surface disturbance does not impair or degrade *Astragalus microcymbus* sites (BLM 1993, p. 2.30). The one known utility corridor impacts only one *A. microcymbus* unit, representing 4 percent of the total rangewide area within units. Given the population growth in the area, we believe there is a moderate likelihood of additional utility corridors in the future. We are unaware of any plan to develop other utility corridors through *A. microcymbus* habitat. Although an existing utility corridor in *A. microcymbus* habitat may impact a small percentage of the overall range of the species, we have no information to indicate that utility corridors occur at a level that threatens the species now or in the foreseeable future.

Nonnative Invasive Plants

Nonnative invasive plants (weeds) invade and alter all types of plant communities, sometimes resulting in nonnative plant monocultures that support little wildlife or native plants. Many experts believe that, following habitat destruction, nonnative invasive plants are the next greatest threat to biodiversity (Randall 1996, pp. 370–383). Nonnative invasive plants alter different ecosystem attributes including geomorphology, fire regime, hydrology, microclimate, nutrient cycling, and productivity (Dukes and Mooney 2004, pp. 411–437). Nonnative invasive plants can detrimentally affect native plants through competitive exclusion, altered pollinator behaviors, niche displacement, hybridization, and changes in insect predation. Invasive grasses can replace native plants such as *Astragalus microcymbus* by outcompeting them for resources, such as soil nutrients or moisture (Brooks and Pyke 2001, p. 6). Examples are widespread among taxa and locations or ecosystems (D'Antonio and Vitousek 1992, pp. 63–87; Olson 1999, pp. 6–18; Mooney and Cleland 2001, pp. 5446–5451).

The only nonnative invasive plant species that has been documented impacting *Astragalus microcymbus* is cheatgrass or downy brome (*Bromus tectorum*). Cheatgrass has become dominant in many sagebrush areas during the last century, primarily from livestock use, agriculture, and wildfire impacts (Pickford 1932, p. 165; Piemeisel 1951, p. 71; Peters and Bunting 1994, p. 34; Vail 1994, pp. 3–4; Brooks and Pyke 2001, pp. 4–6; Menakis *et al.* 2003, p. 284). Cheatgrass displaces native plants by prolific seed production, early germination, and superior competitive abilities for the extraction of water and nutrients (Pellant 1996, pp. 3–4; Pyke 2007, pp. 1–2). Cheatgrass is capable of modifying ecosystems by altering the soil temperatures and soil water distribution (Pellant 1996, p. 4). In addition, the invasion of cheatgrass increases fire frequency within the sagebrush ecosystem (see Wildfire below) (Zouhar *et al.* 2008, p. 41; Miller *et al.* in press, p. 39).

In the mid to late 1980s, cheatgrass was seen in very small patches in the Gunnison Basin but can now be found in greater abundance throughout the Basin (BLM 2009a, pp. 7–8). Cheatgrass is increasing in the South Beaver Creek drainage and has been identified as a major threat to *Astragalus microcymbus*. This threat assessment was made because of how cheatgrass is rapidly expanding elsewhere in the Gunnison Basin (BLM 2010, p. 5). Cheatgrass is moving upslope into *A. microcymbus* areas (BLM 2010, p. 5). In 2009, nine polygons within the South Beaver Creek 1 Unit were discovered with cheatgrass totaling 0.2 ha (0.6 ac) (Service 2010a, pp. 16–17). These polygons did not exist 4 years prior to their discovery (Japuntich 2010f, pers. comm.). In 2010, another small site of cheatgrass was mapped immediately adjacent to the South Beaver Creek 5 Unit, and a 9-ha (22-ac) site with cheatgrass was located 250 m (820 ft) away from the South Beaver Creek 4 Unit (Japuntich 2010f, pers. comm.).

Herbicide use to control cheatgrass in the South Beaver Creek is limited by the close proximity of South Beaver Creek, because chemical spraying within the South Beaver Creek ACEC is not allowed, and vegetative treatments in the South Beaver Creek ACEC must not adversely affect *Astragalus microcymbus* (BLM 1993, p. 2.29; BLM 2010, p. 6). In the spring of 2010, the BLM conducted a mechanical removal effort for cheatgrass to protect *A. microcymbus* at the South Beaver Creek 1 Unit at the nine polygons mentioned above (Japuntich 2010g, pers. comm.). This manual hand-pulling effort that treated several acres of cheatgrass was partially successful (Japuntich 2010g, pers. comm.). Cheatgrass spread also may be facilitated by climate change (see Climate Change below).

Constant weed control efforts are necesary within *Astragalus microcymbus* habitat and many other nonnative invasive species have been documented as occurring that could impact the species in the future. Other nonnative invasive species known from the Hartman Rocks Recreation Area include: Canada thistle (*Cirsium arvense*), scentless chamomile (*Matriacaria perforata*), yellow toadflax (*Linaria vulgaris*), and Russian knapweed (*Acroptilon repens*) (BLM 2005a, p. 47). These species have not been reported from or near *Astragalus microcymbus* areas and are said to have been controlled (BLM 2005a, p. 47). We expect other nonnative invasive species are likely in the area. Other nonnative invasive species known from the Gunnison Resource Area that are reported to take over large areas include: spotted knapweed (*Centaurea maculosa*), oxeye daisy (*Leucanthemum vulgare*), and field bindweed (*Convolvulus arvensis*) (BLM 2009a, p. 7). The following weeds also are known from the Gunnison Basin where they are currently limited in extent; however, they are known to cover large expanses in other parts of western North America: diffuse knapweed (*Centaurea diffusa*), and whitetop (*Cardaria draba*). Other invasive plant species present within the Gunnison Basin that are problematic yet less likely to overtake large areas include: musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), black henbane (*Hyoscyamus niger*), kochia (*Kochia* sp.), common tansy (*Tanacetum vulgare*), and absinth wormwood (*Artemisia biennis*) (BLM 2009a, p. 7; Gunnison Watershed Weed Commission (GWWC) 2009, pp. 4–-6).

We believe the invasion of nonnative invasive plants, particularly cheatgrass, is likely to be a threat to *A. microcymbus* in the near future because: (1) cheatgrass appears to be quickly expanding into the habitat (it was unknown in *A. microcymbus* units just 3 years ago and there are several cheatgrass sites nearby now); (2) the dry, sparsely-vegetated, south-facing slopes where *A. microcymbus* is found are the warmest sites with little competition from other native vegetation (Japuntich 2010h, pers. comm.) and, therefore, are inherently vulnerable to cheatgrass invasion; (3) cheatgrass likely competes with seedlings and resprouting adult plants for water and nutrients; (4) no landscape-scale successful control methods are available for cheatgrass; and (5) cheatgrass has a proven ability to increase fire frequency, thereby facilitating further rapid spread. We conclude that cheatgrass invasion is currently not a threat but we expect that the existing invasion will increase quickly in the near future, and will likely cause fire frequency to increase.

Wildfire

To date, we are aware of only one recent wildfire near *Astragalus microcymbus* habitat (BLM2009a, p. 6). The wildfire burned in 2007 and was 8.1 ha (20 ac) (BLM 2009a, p. 6) in size. The fire burned at a distance of 2–2.5 km (1.25–1.5 mi) away from two *A. microcymbus* units–Henry and Gold Basin Creek. This wildfire was just outside the northwest edge of the Hartman Rocks Recreation Area, adjacent to private land. Three wildfires have burned within the sagebrush of the Gunnison Basin in the last 15 years, the biggest was 200 ha (500 ac) (Japuntich 2010h, pers. comm.). To date there has not been a demonstrated change in the fire cycle where *A. microcymbus* is found, and fire frequency is low.

A common result of the invasion of cheatgrass is an increase in fire frequency within the sagebrush ecosystem (Whisenant 1990, pp. 4–10; D'Antonio and Vitousek 1992, pp. 63–87; Hilty *et al.* 2004, pp. 89–96; Zouhar *et al.* 2008, p. 41; Miller *et al.* in press, p. 39). Cheatgrass changes historical fire patterns by providing an abundant and easily ignitable fuel source that facilitates fire spread. While sagebrush is killed by fire and is slow to reestablish, cheatgrass recovers within 1–2 years of a fire event (Young and Evans 1978, p. 285). This annual recovery ultimately leads to a reoccurring fire cycle that prevents sagebrush reestablishment (Eiswerth *et al.* 2009, p. 1324). The highly invasive nature of cheatgrass poses increased risk of fire and permanent loss of sagebrush habitat, as areas disturbed by fire are highly susceptible to further invasion and ultimately habitat conversion to an altered community state. For example, Link *et al.* (2006, p. 116) show that risk of fire increases from approximately 46–100 percent when ground cover of cheatgrass increases from 12–45 percent or more. While cheatgrass cover is still very low within *Astragalus microcymbus* habitat, its invasion tends to occur rapidly within the Intermountain West, especially after wildfire.

Organisms adapt to disturbances such as historical wildfire regimes (fire frequency, intensity, and seasonality) with which they have evolved (Landres *et al.* 1999, p. 1180), and different species respond differently to wildfire (Hessl and Spackman 1995, pp. 1–90). We do not know what *Astragalus microcymbus'* response to wildfire is at this time because none of the species' habitat has burned. Other *Astragalus* species have demonstrated varying responses to wildfire (see *A. schmolliae* in 75 FR 78541-78542, December 15, 2010; and *A. anserinus* in 74 FR 46526–46529, September 10, 2009). If fire frequency increases in the area, we expect it would have deleterious effects to the habitat, given that big sagebrush recovers slowly, which would presumably affect the ecosystem, and cheatgrass tends to thrive after a wildfire.

We have no information to indicate that wildfires currently occur at levels that impact the species. No fires have burned *Astragalus microcymbus* habitat. However, wildfires have occurred in the area. Furthermore, we realize there is a strong relationship between cheatgrass invasions and fire frequency. If cheatgrass invasion continues to expand as discussed above, the threat of wildfire is likely to increase in the future. Given the small population size of *A. microcymbus* and the potential damage a wildfire could cause, we consider future wildfires to be a threat to the species.

Contour Plowing and Nonnative Seedings

The contour plowings and seedings of crested wheatgrass affect only a small proportion (1.2 percent) of the *Astragalus microcymbus* units. The likelihood of future seedings is low because vegetative treatments that would adversely affect *A. microcymbus* are no longer allowed (BLM 1993, p. 2.29). Because crested wheatgrass continues to invade native habitats from these seedings, and because the plowed areas may not provide good floral resources for pollinators, we find these continuing effects of past contour plowing and nonnative seeding to impact the species but not to the point where it poses a threat to the continued existence of the species. We expect crested wheatgrass and pollinator impacts to continue into the foreseeable future since it does not appear that the crested wheatgrass is disappearing. For further discussion please see the 12-month finding.

Livestock, Deer, and Elk Use of Habitat

Livestock Use–Potential threats related to livestock, deer, and elk use include the eating of individual plants, physical effects from trampling, and the indirect effects of habitat degradation. We are unaware of any research or monitoring that has evaluated the effects of livestock, deer, or elk use on *Astragalus microcymbus*

. However, the deleterious effects of livestock on western arid ecosystems are well documented (Milchunas *et al.* 1992, pp. 520–531; Jones 2000, pp. 155–164). Some of the adverse effects from livestock include changes in the timing and availability of pollinator food plants (Kearns and Inouye 1997, pp. 298–299); changes to insect communities (Kearns and Inouye 1997, pp. 298–299; Debano 2006, pp. 2547–2564); damage to ground-nesting pollinators and their nests (Sugden 1985, p. 309); changes in water infiltration due to soil compaction (Jones 2000, Table 1); disturbance to soil microbiotic crusts (Belnap *et al*. 1999, p. 167; Jones 2000, Table 1); subsequent nonnative invasive plant invasions (Parker *et al.* 2006, pp. 1459–1461); and soil erosion from hoof action (Jones 2000, Table 1).

Without any species-specific research or monitoring of livestock use, our understanding of impacts to *Astragalus microcymbus* is limited and observational in nature. Little livestock grazing has been recorded within *A. microcymbus* areas; most plants are located on steep slopes with little vegetation that do not draw cows to them (BLM 2010, p. 4). We expect that the plant was always found primarily on slopes, but do not know if the current distribution has been influenced by increased livestock use in flatter areas. In 2008, after visiting all *A. microcymbus* sites, only one appeared to have been directly grazed by livestock (BLM 2010, p. 5). Several observers have attributed increased erosion within *A. microcymbus* sites to cattle use, but this impact also could be from deer or elk use (CNHP 2010a, pp. 12, 27, 32). Grazing utilization levels were reportedly low in 1994 but physical damage to *A. microcymbus* individuals from trampling at two sites was noted (Sherwood 1994, pp. 11, 17, 20). In another review, the authors speculated the periodicity and intensity of grazing may influence the success of *A. microcymbus* by the removal of individuals and ground cover, thereby influencing seedling success (Peterson et al. 1981, p. 16). Numerous livestock trails, feces, and tracks were found within most *A. microcymbus* sites visited in 2010 (Service 2010, pers. comm.). Within the Hartman Rocks Recreation Area, overall plant cover has been reduced by historic excessive livestock grazing, drought, grazing during the extreme drought years of 1990 through 1992, 2000, and 2001, and the physical impacts from roads and trails (BLM 2005a, p. 56).

Although grazing damage is minimal, all *Astragalus microcymbus* areas receive at least some livestock use. Aside from the Cebolla Creek Unit, all units on BLM lands are either in the Gold Basin or Iola grazing allotments and are actively grazed by cattle. Those units with private lands also are grazed on their private portions. In 2010, 56.1 percent of the *A. microcymbus* units fell within the Gold Basin allotment and 43.9 percent fell within the Iola allotment, with no ungrazed areas (BLM 2010; Service 2010a, pp. 6–7). Within the South Beaver Creek ACEC, no additional forage allocations, beyond those already authorized for the allotments will be made and domestic sheep grazing will not be authorized (BLM 2005a, pp. 2–29 to 2–30).

Fences and water developments have been constructed within the range of *Astragalus microcymbus* to help manage livestock grazing activities, increase the number of livestock that the landscape can support, keep animals in specific areas, and distribute grazing more evenly on the landscape (BLM 2005a, p. 12). All of the pastures are fenced, so the four *A. microcymbus* units with multiple pastures or allotments also have fences (Gold Basin Creek, South Beaver Creek 1, South Beaver Creek 2, and South Beaver Creek 3).

Water developments occur across the range of *Astragalus microcymbus* (Japuntich 2010i, pers. comm.). One water development is within 300 m (985 ft) of the Henry Unit: two are within and two are just outside the Gold Basin Creek Unit; and an additional three developments are just outside the unit: one within the South Beaver Creek 1 Unit; and one within 400 m (1,312 ft) of the South Beaver Creek 6 Unit (Japuntich 2010i, pers. comm.). Within the Henry Unit, several livestock trails run through the *A. microcymbus* site. We assume these trails are from livestock travelling to and from the water development 300 m (985 ft) away and expect that similar effects are occurring from the other water developments listed above. Water developments concentrate livestock use in areas near these developments, and fence lines often funnel livestock, and even deer and elk, into certain areas that will receive a disproportionate amount of use. We do not have further information regarding whether the close proximity of water developments or fence lines is causing increased impacts to *A. microcymbus* habitat, but we expect this is the case because there are several fences running through sites and because livestock grazing is found atop all sites.

In addition, salt blocks draw livestock (and deer and elk) to the areas where they are placed. We know of one instance where a salt block has been placed within an *Astragalus microcymbus* site. This area was extensively trampled, there were fewer *A. microcymbus* individuals in trampled areas than surrounding polygons, and those plants that remained were located almost exclusively under shrubs (Service 2010, pers. comm.). Trails to and from the salt block were impacting adjacent *A. microcymbus* polygons (Service 2010, pers. comm.).Since this incident, maps of the species' locations have been provided to the permitees to avoid salt block placement atop populations (BLM 2011, p. 3).

The Gold Basin allotment is authorized for use between May 16 and September 30 each year, and is used from May 25–July 31, the time when *Astragalus microcymbus* is growing and reproducing, in most years (BLM 2010, p. 5). Pastures used by cow/calf pairs are generally used for 5–15 days a year and those used by yearlings are generally used for 15–30 days each year. Pastures are rested occasionally in some years, although when and how often this occurs is unknown. The Gold Basin allotment is permitted for 4,253 animal unit months (AUMs) a year but has averaged 1,405 AUMs over the last 6 years. Approximately 30 percent of the AUMs are within the pastures where *A. microcymbus* units are located (BLM 2010, p. 5). In 2007, this allotment was found to have heavy use in some riparian areas and poor herbaceous cover in the lowest elevation uplands, where *A. microcymbus* would be found. These results were attributed to historic vegetation manipulation and livestock grazing practices (BLM 2009b, pp. 1–2). Given that damage is occurring at lower than permitted stocking rates and shorter than permitted periods of time, the potential for further damage exists.

The Iola allotment is authorized for use between May 15 and November 14 each year, but is used from late May/early June (sometimes late June/early July) generally 15–20 days in most years (BLM 2009b, pp. 1–2; BLM 2010, p. 5). These times again coincide with the time when *Astragalus microcymbus* is growing and reproducing. The permittee is authorized up to 1,258 AUMs in the pasture, but has used an average of 250 AUMs for the last 6 years (BLM 2010, p. 5). A new allotment management plan and grazing system was developed for this allotment in 2002. During this analysis, grass cover was below potential, and riparian vegetation was being consistently grazed to less than 10 cm (4 in.) (BLM 2009b, pp. 1–2). Again, given that damage is occurring at lower than permitted stocking rates and shorter than permitted periods of time, the potential for further damage exists.

Deer and Elk Use–Livestock impacts to the habitat are similar to those impacts to the habitat caused by excessive deer and elk use (Japuntich *et al.* in press, pp. 1–15). For example, Hobbs *et al.* (1996, pp. 200–217) documented a decline in available perennial grasses as elk densities increased. All *Astragalus microcymbus* areas are within areas that receive deer and elk use. Grazing and browsing by deer and elk occurs primarily during the winter months when there is less snow in the valley than the surrounding hills. Deer numbers have seen a strong increase in the Gunnison Basin since 1999 (Gunnison-Crested Butte 2010, p. 2). *A. microcymbus* is found within the Powderhorn Creek Game Management Unit (deer). In 2005, this unit had between 600 and 1,600 more deer than its objective of 4,500–5,500 individuals (Colorado Division of Wildlife (CDOW) 2006, p. 3). Since 1980, deer numbers within this unit have been as high as 8,000 individuals in 1993 and as low as 4,500 individuals in 1984; and averaging near 7,000 individuals from 2000 to 2005 (CDOW 2006, p. 3). From 1980 to 2000, elk numbers in the Lake Fork Managment Unit (where *A. microcymbus* is found) rose from 5,600 individuals to 9,256 individuals; both numbers are substantially greater than the 3,000–3,500 population objective (CDOW 2001, pp. 3, appendix A). Currently in the Gunnison Basin, deer and elk populations have 8,000 more individuals than the desired population objectives (Japuntich *et al.* in press, p. 4).

Excessive but localized deer and elk grazing has been documented in the Gunnison Basin (BLM 2005b, pp. 17–18). For example, drought and big game were having large impacts on the survivability and size of high-protein shrubs including mountain mahogany (*Cercocarpus utahensis*), bitterbrush (*Pushia tridentata*), and serviceberry (*Amelanchier alnifolia*) in the Gunnison Basin (Japuntich *et al.* in press, pp. 7–9). These shrub species are not the most common within *A. microcymbus* habitat but are generally found nearby. These authors raised concerns that observed reductions in shrub size and vigor will reduce drifting snow accumulation resulting in decreased moisture availability to grasses and forbs during the spring melt, affecting the overall composition of the plant community.

Impacts to *Astragalus microcymbus* habitat from deer and elk are occurring. For example, extensive moderate to severe hedging of shrubs, attributed to fairly heavy concentrations of wintering big game animals, has been documented at one *A. microcymbus* site in the South Beaver Creek 5 Unit (Sherwood 1994, p. 16). Deer and elk feces can be found at most *A. microcymbus* sites (Service 2010, pers. comm.). Deer and elk use occurs primarily in the winter when *A. microcymbus* is dormant, which minimizes some of the direct effects to the plants. However, deer and elk are more likely to spend time on steeper slopes than livestock and so may cause more direct trampling impacts to *A. microcymbus* habitat including soils, seed banks, and plant communities.

Summary of Livestock, Deer, and Elk Use–Describing livestock, deer, and elk use is complicated because the management of these animals is complicated. Although we lack good monitoring data, we find livestock, deer, and elk use of *Astragalus microcymbus* habitat to be a threat to the species. We have made this determination based upon observations that suggest moderate use levels from livestock and heavy deer and elk use in the winter. Use from livestock, deer, and elk is virtually ubiquitous across the range of the species, and habitat degradation is occurring, although we recognize that these indirect effects to *A. microcymbus* habitat are difficult to quantify. Authorized AUMs are significantly greater than those currently utilized. If livestock use were to increase, this threat would increase in the foreseeable future. The current number of deer and elk is above population objectives, and past fluctuations suggest that more animals are a possibility, which would also increase this threat in the foreseeable future. In addition, the accompanying habitat degradation with livestock, deer, and elk use makes this an increasing threat especially in light of the cheatgrass invasion.

Mining; Oil and Gas Leasing

The South Beaver Creek ACEC has one active lode claim and one active placer claim for mining. Lode claims are those which generally follow some deposited vein while placer mining is everything else and can include sand and gravel deposits. One of these active claims is within the Gold Basin Creek Unit, and the other is nearby. Neither of these claims have Notices of Intent or Plans of Operation that are required for most disturbances (BLM 2010, pp. 5–6). On active claims, Notices of Intent are required for disturbances less than 2 ha (5 ac) at least 15 days prior to commencement of operation. A Plan of Operation, required for disturbances greater than 2 ha (5 ac), requires NEPA compliance and can take between 30 and 90 days to process. The transfer of these mineral claims to private entities is prohibited within the South Beaver Creek ACEC (BLM 1993, p. 2-29). A large gravel pit is at the northwest corner of the Hartman Rocks Recreation Area on BLM lands and is within 1.6 km (1 mi) of the Henry and Gold Basin Creek Units. Because of this distance, we expect there are probably no effects to *A. microcymbus* from this gravel operation. A gravel pit was said to be on private lands at the Beaver Creek Southeast Unit, but we have no further information and, based on our maps, we do not see a gravel pit near this location (Sherwood 1994, p. 15).

No lands for oil and gas development have been leased by the BLM within the Gunnison Basin area (USFS and BLM 2010, pp. 272–273). All habitats where *Astragalus microcymbus* is currently found are mapped as having no potential for oil and gas development (Gunnison Sage-Grouse Resource Steering Committee 2005, p. 130). Despite this lack of potential, the entire Federal oil, gas, and geothermal estates in the South Beaver Creek ACEC are open to leasing but with a controlled surface use stipulation (BLM 1993, pp. 2.29, K.5). This stipulation requires that inventories be conducted prior to the approval of operations and relocations of operations. These inventories will be used to prepare mitigative measures to reduce the impacts of surface disturbance to the species (BLM 1993, p. K.5).

Given that there are only two existing active mining claims (but without current activity) within *Astragalus microcymbus* units and that there is no potential for oil and gas development in the area, we do not consider mining or oil and gas leases to threaten the species at this time nor do we expect these factors to pose a threat to the species in the foreseeable future.

Climate Change

According to the Intergovernmental Panel on Climate Change (IPCC), "Warming of the climate system in recent decades is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global sea level" (IPCC 2007, p. 1). Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1,300 years (IPCC 2007, p. 30). Over the past 50 years, cold days, cold nights, and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent. Heat waves have become more frequent over most land areas, and the frequency of heavy precipitation events has increased over most areas (IPCC 2007, p. 30). For the southwestern region of the United States, including western Colorado, warming is occurring more rapidly than elsewhere in the country (Karl *et al.* 2009, p. 129). Annual average temperature in west-central Colorado increased 3.6 °C (2 °F) over the past 30 years, but high variability in annual precipitation precludes the detection of long-term trends (Ray et al. 2008, p. 5). At one weather station in Gunnison, Colorado, temperature has increased roughly 1.8 °C (1 °F) since 1900 (WRCC 2010b, pp. 1–9).

Future projections for the southwestern United States, including the Gunnison Basin, show increased probability of drought (Karl *et al.* 2009, pp. 129-134). Additionally, the number of days over 32 °C (90 °F) could double by the end of the century (Karl *et al.* 2009, p. 34). Annual temperature is predicted to increase approximately 2.2 °C (4 °F) in the southwest by 2050, with summers warming more than winters (Ray *et al.* 2008, p. 29). Projections also show declines in snowpack across the West with the most dramatic declines at lower elevations (below 2,500 m (8,200 ft)) (Ray *et al.* 2008, p. 29). Overall, future projections for the Southwest predict increased temperatures, more intense and longer-lasting heat waves, an increased probability of drought that are worsened by higher temperatures, heavier downpours, increased flooding, and increased erosion (Karl *et al.* 2009, pp. 129–134).

Colorado's complex, mountainous topography results in a high degree of spatial variability across the State. As a result, localized climate projections are problematic for mountainous areas because current global climate models are unable to capture this variability at local or regional scales (Ray *et al.* 2008, pp. 7, 20). To obtain climate projections specific to the range of *Astragalus microcymbus*, we used a statistically downscaled model from the National Center for Atmospheric Research for a region covering western Colorado. The resulting projections indicate that temperature could increase an average of 2.5 °C (4.5 °F) by 2050 with the following seasonal increases: summer (July through September) 2.8 °C (5.0 °F), fall (October through December) 2.2 °C (4.0 °F), winter (January through March) 2.3 °C (4.1 °F), and spring (April through June) 2.5 °C (4.5 °F) (University Corporation of Atmospheric Research (UCAR) 2009, pp. 1-14). This increase in temperature could be problematic for *A. microcymbus* because the species is negatively affected by warm temperatures during May and July (DBG 2010a, p. 6).

Annual mean precipitation projections for Colorado are unclear; however, multi-model averages show a shift toward increased winter precipitation and decreased spring and summer precipitation by the end of the century (Ray *et al.* 2008, p. 34; Karl *et al.* 2009, p. 30). Similarly, the National Center for Atmospheric Research results show the highest probability of a 7.5 percent increase in average winter (January through March) precipitation, an 11.4 percent decrease in average spring (April through June) precipitation, a 2.1 percent decrease in average summer (July through September) precipitation, and a 1.3 percent increase in average fall precipitation with an overall very slight decrease in 2050 (UCAR 2009, pp. 1–14). Seasonal trends from the past 100 years at a local weather station do not yet match this scenario, and overall precipitation has declined by roughly 2 cm (0.75 in.) or 10 percent (WRCC 2010c, pp. 1–8). This actual data is in contrast to regional maps that show precipitation has increased roughly 5 percent from 1958 to 2008 within the general area where *Astragalus microcymbus* resides (Karl *et al.* 2009, p. 30). *A. microcymbus* responds negatively to declines in overall precipitation and periods of drought, as well as declines in spring precipitation (May and July) (DBG 2010a, p. 6). Given the observed decline in precipitation at a local weather station, predictions of increased drought, and a predicted significant decline in spring precipitation, we expect *A. microcymbus* will be affected negatively by climate change effects to precipitation.

Climate change is likely to alter fire frequency, community assemblages, and the ability of nonnative species to proliferate. Increasing temperature as well as changes in the timing and amount of precipitation will alter the competitive advantage among plant species (Miller *et al.* in press, p. 44), and may shift individual species and ecosystem distributions (Bachelet *et al.* 2001, p. 174). Dominant plant species such as big sagebrush have a disproportionate control over resources in ecosystems (Prevey *et al.* 2009, p. 1). For sagebrush communities, spring and summer precipitation comprises the majority of the moisture available to species; thus, the interaction between reduced precipitation in the spring-summer growing season and increased summer temperatures will likely decrease growth of big sagebrush and could result in a significant long-term reduction in the distribution and composition of sagebrush communities (Miller *et al.* in press, pp. 41–45). In the Gunnison Basin, increased summer temperature was strongly correlated with reduced growth of big sagebrush (Poore *et al.* 2009, p. 558). Although we do not fully understand how changes in plant communities will affect *Astragalus microcymbus*, we expect that a decrease in the dominant plant species will not be a benefit because it could drastically alter the way the ecosystem functions where *A. microcymbus* resides. In addition, changes in the plant community could likely influence wildfire frequency and erosion rates.

Temperature increases may increase the competitive advantage of cheatgrass in higher elevation areas where it is currently limited (Miller *et al.* in press, p. 47), like the Gunnison Basin. Decreased summer precipitation, as predicted in the model, reduces the competitive advantage of summer perennial grasses, reduces sagebrush cover, and subsequently increases the likelihood of cheatgrass invasion (Prevey *et al.* 2009, pp. 1–13). This impact could increase the susceptibility of areas within *Astragalus microcymbus'* range to cheatgrass invasion (Bradley 2009, p. 204). In addition, cheatgrass and other C3 grasses (C3 refers to one of three alternative photosynthetic pathways) are likely to thrive as atmospheric carbon dioxide increases (Mayeux *et al.* 1994, p. 98). An increase in cheatgrass would likely increase wildfire frequency. See Nonnative Invasive Plants above for a discussion of cheatgrass and effects to *A. microcymbus*.

Climate change predictions are based on models with assumptions, and are not absolute. In addition, we do not fully understand how climate change will affect the species or the habitat in which it resides. These factors make it difficult to predict the effects of climate change to *Astragalus microcymbus*. However, endemic species with limited ranges that are adapted to localized conditions, like *A. microcymbus*, are expected to be more severely impacted by climate change (Midgley *et al.* 2002, p. 448) than those considered habitat generalists. Furthermore, we expect the predicted increases in spring temperature, increased drought, and decreased spring precipitation will affect *A. microcymbus* negatively. Climate change has the potential to change the plant community, allow cheatgrass to increase, and potentially increase the risk of wildfire, which would likely have a negative effect to *A. microcymbus*. It is difficult to assess the threat of climate change to *A. microcymbus* given the uncertainties associated with future projections. However, based on the best available information on climate change projections into the next 40 years, we find climate change to be a threat to *A. microcymbus* based on how predicted changes could negatively influence the species. We recognize there are many uncertainties, and projections further into the future become even more uncertain, making it even more difficult to predict how climate change might affect the species.

Habitat Fragmentation and Degradation

Habitat fragmentation can have negative effects on biological populations, especially rare plants, and affect survival and recovery (Aguilar *et al.* 2008, pp. 5177-5188). Often fragments are not of sufficient size to support the natural diversity prevalent in an area and so exhibit a decline in biodiversity (Noss and Cooperrider 1994, pp. 50–54). Habitat fragments are often functionally smaller than they appear because edge effects (such as increased nonnative species or wind speeds) impact the available habitat within the fragment (Lienert and Fischer 2003, p. 597). Habitat fragmentation has been shown to disrupt plant-pollinator interactions and predator-prey interactions (Steffan-Dewenter and Tscharntke 1999, pp. 432–440), alter seed germination percentages (Menges 1991, pp. 158–164), and result in low fruit set (Cunningham 2000, pp. 1149–1152). Extensive habitat fragmentation can result in dramatic fluxes in available solar radiation, water, and nutrients (Saunders *et al*. 1991, pp. 18–32).

Fragmentation within *Astragalus microcymbus* habitat is largely from linear features such as roads and utility corridors (see Recreation, Roads, and Trails and Utility Corridors above) that are pervasive at every *A. microcymbus* unit except the South Beaver Creek 4 Unit. In addition, past contour plowings and subsequent seeding efforts have created blocks of altered and degraded habitat around *A. microcymbus* units that may affect the overall plant community, nonnative invasive plants, and pollinator habitat and resources. This type of fragmentation does not carry the same negative consequences as that of more highly fragmented habitats impacted by agricultural or urban development because of its more limited extent.

However, the aforementioned type of fragmentation leads to habitat degradation. Habitat degradation, the gradual deterioration of habitat quality, can lead to a species decline, decrease, or loss of reproductive ability. Habitat degradation may be difficult to detect because it takes place over a long time period, and species with long life-cycles may continue to be present in an area even if they are unable to breed (Fisher and Lindenmayer 2007, pp. 268–269).

In the case of *Astragalus microcymbus*, habitat degradation is coming from multiple sources: Development; recreation, roads, and trails; utility corridors; nonnative invasive plants; contour plowing and nonnative seedings; and accentuated by periodic drought. In addition, wildfire and climate change will likely contribute to further habitat degradation. Detailed monitoring is needed to detect population changes and signal the need to implement conservation measures that could counteract habitat degradation, but this monitoring has not been done for *A. microcymbus*.

Habitat fragmentation and habitat degradation is occurring as a result of multiple sources including virtually all the threats and factors previously described in this document. As a result, we find habitat degradation to be a threat to Astragalus microcymbus. Habitat fragmentation is currently a lesser threat, but because it is so tightly linked with habitat degradation, we have treated them jointly.

Summary of Factor A

The biggest habitat-related threats to *Astragalus microcymbus* are recreation (including roads and trails); the potential for increases in nonnative invasive plants (especially cheatgrass); potential residential and urban development; livestock, deer, and elk use; and potential effects from climate change. In addition, the habitat degradation and fragmentation occurring from these stressors threatens *A. microcymbus*.

Recreational impacts are not likely to lessen given the close proximity of *Astragalus microcymbus* to the town of Gunnison and the increasing popularity of mountain biking, motorcycling, and all-terrain vehicles. The presence of the Hartman Rocks Recreation Area within 40 percent of the *A. microcymbus* units will only serve to draw more users, and there is little enforcement to control trespass use. Accordingly, we find the threat from recreation, roads, and trails to be high.

Although the impacts from nonnative invasive plants, and particularly cheatgrass, are low right now, we expect this factor to increase to the level of a serious threat in the near future. Cheatgrass is increasing in the South Beaver Creek drainage and has been identified as a major threat to *Astragalus microcymbus* (BLM 2010, p. 5). In the mid to late 1980s, cheatgrass was seen in very small patches in the Gunnison Basin but can now be found in abundance throughout the Basin (BLM 2009a, pp. 7–8). *A. microcymbus* is found on warm, sparsely vegetated, and dry, south-facing slopes, which in the Gunnison Basin, are probably more vulnerable to cheatgrass invasion. We know that cheatgrass is already invading *A. microcymbus* sites. Cheatgrass has transformed millions of acres into monocultures in the Great Basin and has dramatically shortened the wildfire return interval. We believe the potential exists for a similar conversion in *A. microcymbus* habitat.

Although we find the current invasion of cheatgrass into *A. microcymbus* habitat to be small and pose little threat, because of the high potential for further invasion, we find the overall threat is increasing.

It is difficult to assess the impact of climate change to *Astragalus microcymbus*, but we believe climate change may be a future threat given the predictions of increased spring time temperatures, decreased spring time precipitation, and increased drought.

Because a quarter of the *Astragalus microcymbus* units occur on private land, and given the rapid pace of development in the Gunnison Basin, we believe residential and urban development represent a moderate threat to *A. microcymbus*. Given that livestock, deer, and elk use occurs across the range of *A. microcymbus*, that *A. microcymbus* individuals are being lost from this use, and that this use is causing habitat degradation that could facilitate the spread of cheatgrass, we find this threat to be moderate.

We find the potential impact of future wildfire to be a threat to the species and recognize that wildfire risk may increase with further cheatgrass invasion. We do not find utility corridors to be a threat because they currently impact only 4 percent of the *Astragalus microcymbus* units and we do not know of any further utility corridor plans. We do not find the continuing effects from past contour plowings and nonnative seedings to be a threat because the existing plowings only impact 1.2 percent of the *A. microcymbus* units and we do not expect these treatments to occur in the future. Because of the low potential for oil and gas development and because there are only two other active mining claims within the species' range, we do not find that these factors are threats to the species.

Based on threats from recreation; the potential for increases in nonnative invasive plants; potential residential and urban development; livestock, deer, and elk use; and potential effects from climate change, we find that *Astragalus microcymbus* is threatened by the present or threatened destruction, modification, or curtailment of its habitat or range now and these threats are expected to continue or increase in the foreseeable future.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

We are not aware of any threats involving the overutilization or collection of *Astragalus microcymbus* for any commercial, recreational, scientific, or educational purposes at this time. *A. microcymbus* is not particularly showy or of horticultural significance; therefore, we do not expect any overutilization in the foreseeable future. We find that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to *A. microcymbus* now or expected to become so in the foreseeable future.

C. Disease or predation:

Astragalus microcymbus is subject to extensive herbivory, primarily from small mammals (Lyon 1990, pp. 2, 5; Dyer 1993, p. 2; Sherwood 1994, pp. 10–11; Japuntich 2010j, pers. comm.; DBG 2010a, pp. 6–7). On average, 26 percent of the plants have evidence of herbivory (ranging from 13 to 74 percent at a given plot) (DBG 2010a, p. 6). Browsing on the plants is very evident and in some areas, it is hard to find an *A. microcymbus* individual that has not had at least some portion eaten (Japuntich 2010j, pers. comm.). Some species of *Astragalus* are notoriously toxic to livestock, and presumably deer and elk. Often these toxic species are avoided by grazers and browsers. However, the high level of small mammal herbivory to *A. microcymbus* plants suggests the species is not overly toxic. We do not know if this toxicity would vary between livestock and rabbits.

Small Mammal Herbivory

Most herbivory of *Astragalus microcymbus* individuals is attributed to small mammals. Cottontail rabbits (*Sylvilagus audobonii*), small chipmunks (*Tamias* sp.), and ground squirrels (*Citellus lateralis* and others) graze on *A. microcymbus* (Japuntich 2010j, pers. comm.). Mice and voles also have been implicated as herbivores (Sherwood 1994, p. 11). Rabbits are generally considered the primary herbivores of *A. microcymbus*, and numerous observers have suggested they are in abundance within *A. microcymbus* habitat (Lyon 1990, p. 2; Dyer 1993, p. 2; Japuntich 2010j, pers. comm.).

The information we have regarding rabbit herbivory is mostly anecdotal in nature; however, taken in sum, we believe this information leads to a conclusion that rabbit herbivory impacts *Astragalus microcymbus* in years with high rabbit populations. During one survey effort, observers found six rabbits in one of the draws they visited (Lyon 1990, p. 5), and another observer visited 10 *A. microcymbus* sites in a day and said that rabbit damage was heavy at nine of those sites (Dyer 1993, p. 2).

Several observers have suggested that rabbit herbivory can result in the death of *Astragalus microcymbus*. One observer suggested that 2 years of heavy rabbit use was more than *A. microcymbus* could tolerate because of all the dead plants they encountered in a heavy rabbit year (Lyon 1990, p. 5). Those plants that were not dead had only a few green leaves, again attributed to rabbit herbivory (Lyon 1990, p. 2). After 2 years of consecutive transect counts at a site another observer stated that many plants had died and attributed that death to overuse by rabbits (Sherwood 1994, p. 10). Observations of small mammal herbivory being a significant impact to the species occurs across the years (Service 2011a, pp. 1–4).

Rabbit and small mammal populations fluctuate widely (Korpimäki and Krebs 1996, pp. 754–764; Hanski *et al.* 2001, pp. 1501–1520). We have little information on how small mammal populations have changed within the range of *Astragalus microcymbus* over time, but the variability in observations from year to year and between sites suggest there are significant fluctuations and spatial variations. For example in 1990, local authorities and those surveying for *A. microcymbus* stated the rabbit population was very large compared with other years; this year, herbivory of *A. microcymbus* was repeatedly observed (Lyon 1990, p. 2). Observations suggest that small mammal herbivory is impacting A. microcymbus, especially during years when small mammal populations are high.

Fencing to exclude small mammals was installed at monitoring plots in 2006 and 2007 (DBG 2010a, p. 6). After 2 years, the plants protected by fences were statistically longer at 31.4 cm (12.4 in.) than those outside the fence, which were 19.5 cm (7.7 in.) (DBG 2010a, p. 6). This difference could be related to a decrease in herbivory or increased moisture (from additional snow accumulations within the fence from wind loading) within the exclosures, or a combination of the two. In addition, mammal herbivory was less within the fenced areas, more individuals flowered within fenced areas, and more total fruit were produced per plant within fenced areas (DBG 2010a, p. 7). A weak statistical correlation was found between nonreproductive plants and evidence of mammalian browsing across all plots (DBG 2010a, p. 6). Although we do not understand how small mammal populations have changed over time, these impacts to fruit set are significant. Furthermore, these impacts are consistent with other observations of small mammal herbivory (Service 2011a, pp. 1–4).

Rabbit herbivory has been documented at several *Astragalus microcymbus* units, including Gold Basin Creek, South Beaver Creek 1, South Beaver Creek 2, and South Beaver Creek 3 (Service 2011a, pp. 1–4). Conversely, at several of the more isolated *A. microcymbus* units, Henry and South Beaver Creek 4, observers specifically mention the lack of rabbit herbivory relative to other areas (Service 2011a, pp. 1–4).

We are unsure of the long-term impact to *Astragalus microcymbus* over time from small mammal herbivory. Small mammal herbivory is significantly impacting seed set of *A. microcymbus*. Fewer seeds mean fewer opportunities for seedling and adult recruitment. In addition, small mammal herbivory occurs at most sites across the range of the species, and recent observations indicate that damage to plants is heavy. We have no information to either support or refute that rabbit herbivory levels are higher than historic levels; however, in light of other factors affecting the species and the limited range and small population level, impacts to *A. microcymbus* from herbivory can be large in years of high rabbit populations. Given this, we find small mammal herbivory to be a threat to the species.

Insect herbivory

Grasshoppers (Orthopterans in the Acrididae and Tettigoniidae families) have been implicated as herbivores of *Astragalus microcymbus* (Dyer 1993, p. 2). Aphids have been documented on the plants at one *A. microcymbus* site (CNHP 2010a, p. 22). A small number of *A. microcymbus* individuals have been documented with insect webs within Gold Basin Creek Unit (Sherwood 1994, p. 7). Insect herbivory was measured as part of the life-history monitoring study. This study found no significant effects from insect herbivory on flowering individuals (DBG 2010a, p. 6). Therefore, we find that insect herbivory does not constitute a threat to *A. microcymbus* now or in the foreseeable future.

Disease

A fungus has been documented on less than 10 percent of the *Astragalus microcymbus* individuals at one monitoring transect (Sherwood 1994, p. 11). No other instances of disease are known. Therefore, we find that disease does not constitute a threat to *A. microcymbus* now or in the foreseeable future.

Summary of Factor C

Various herbivores have been documented at *Astragalus microcymbus* sites. Small mammal herbivory, especially from rabbits, has been documented at fairly high levels, and appears to be the only type of herbivory that is impacting the species at a low to moderate level. Exclusion research has found that small mammal herbivory was less, more individuals flowered, and there were more total fruits within fenced areas (DBG 2010a, p. 7). We expect small mammal herbivory to continue into the foreseeable future and fluctuate with small mammal populations. We do not believe that deer and elk herbivory, livestock herbivory, and insect herbivory constitute threats because they are only affecting *A. microcymbus* occasionally or in a minor way and are not expected to increase into the foreseeable future. Finally, we do not consider disease to be a threat because it is so rare. However, we do find that *A. microcymbus* is threatened by predation now and these threats are expected to continue or increase in the foreseeable future.

D. The inadequacy of existing regulatory mechanisms:

Under this factor, we examine whether threats to *Astragalus microcymbus* are adequately addressed by existing regulatory mechanisms. Existing regulatory mechanisms that could provide some protection for A. microcymbus include: (1) local land use laws, processes, and ordinances; (2) State laws and regulations; and (3) Federal laws and regulations. Regulatory mechanisms, if they exist, may preclude listing if such mechanisms are judged to adequately address the threat to the species such that listing is not warranted.

An example of a regulatory mechanism is the terms and conditions attached to a grazing permit that describe how a permittee will manage livestock on a BLM allotment. They are nondiscretionary and enforceable, and would be considered a regulatory mechanism under this analysis. Other examples include city or county ordinances, State governmental actions enforced under State statute regulations, or Federal action under statute or regulation. Actions adopted by local groups, States, or Federal entities that are discretionary or are not enforceable, including conservation strategies and guidance, are typically not regulatory mechanisms. In this section we review actions undertaken by local, State, and Federal entities designed to reduce or remove threats to *Astragalus microcymbus* and its habitat.

Local Land Use Laws and Ordinances

We are aware of no local land use laws or ordinances that offer protection to *Astragalus microcymbus*. Neither the city of Gunnison nor the counties of Gunnison or Saguache have guidelines, zoning, or other mechanisms to protect the species. No existing Federal laws protect the plant on private lands.

State Laws and Regulations

No State regulations in Colorado protect *Astragalus microcymbus*. The State of Colorado has no laws protecting any rare plant species. Plants also are not included in the Colorado Wildlife Action Plan and do not qualify for funding under State Wildlife Grants.

The State of Colorado's Natural Areas Program works to protect special resources in the State, although there are no regulatory enforcement mechanisms associated with the program. In 1997, the Colorado Natural Areas Program designated the South Beaver Creek Natural Area (CNAP 1997, pp. 1–7). The South Beaver Creek Natural Area was designated for all areas within the South Beaver Creek ACEC (CNAP 1997, p. 7). The Colorado Natural Areas Program provides a means by which Colorado's natural features and ecological phenomena can be identified, evaluated, and protected through a statewide system of natural areas (CNAP 1997, p. 1). The purpose of the South Beaver Creek Natural Area is to protect *Astragalus microcymbus* (CNAP 1997, p. 2).

Through this designation, the Colorado Natural Areas Program staff is entitled to visit the area at any time and convey the results of these visits to the BLM, cooperate with the BLM on updating the Resource Management Activity Plan for the property, and provide a periodic report on the condition of the property (CNAP 1997, p. 3). In essence, this designation allows the Colorado Natural Areas Program to assist the BLM with its management. The Colorado Natural Areas Program has not been actively monitoring *Astragalus microcymbus* at the South Beaver Creek Natural Area. Therefore, this designation has, to-date, afforded little protection to the species. Given that the Colorado Natural Areas Program is increasing its conservation efforts, we expect the Natural Areas Program to become more active in the conservation of *A. microcymbus* in the future but have no way of predicting what this will mean to the species.

The State of Colorado requires private landowners to control noxious (nonnative invasive) weeds. Plants considered noxious by the State of Colorado that are within or near *Astragalus microcymbus*' habitat include: cheatgrass (List C), Canada thistle (*Cirsium arvense* – List B), scentless chamomile (*Matriacaria perforata* – List B), yellow toadflax (*Linaria vulgaris* – List B), and Russian knapweed (*Acroptilon repens* – List B) (Colorado Department of Agriculture [CDA] 2010, pp. 2–3). List B species are noxious weeds for which management plans are or will be developed and implemented to stop their spread (CDA 2010, p. 2). List C species are noxious weeds for which management plans are or will be developed and implemented to provide additional education, research, and biological control resources but for which the continued spread will not be halted (CDA 2010, p. 2). We have no information on how the noxious weed law is being implemented within the range of *A. microcymbus*. We do know that the Gunnison Watershed Weed Commission has been actively working to control and eradicate noxious weeds in Gunnison County but we have few specifics from this work (GWWC 2009, pp. 1–8). Therefore, we cannot assess the benefits to *A. microcymbus*.

Deer and elk populations are managed by the CDOW. We have no information to suggest that deer and elk use is being regulated to ensure *Astragalus microcymbus* and its habitat are not impacted by this use.

Federal Laws and Regulations

The BLM has promulgated regulations, policies, and guidelines to protect sensitive species on Federal lands, control wildfire and rehabilitate burned areas, and implement rangeland assessments, standards, and guidelines to assess rangeland health.

Astragalus microcymbus is included on the Colorado BLM's sensitive species list (BLM 2009c, p. 3). The management guidance afforded sensitive species under BLM Manual 6840 – Special Status Species Management (BLM 2008) states that "Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA" (BLM 2008, p. .05V). The BLM Manual 6840 further requires that Resource Management Plans (RMPs) should address sensitive species, and that implementation “should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary” (BLM 2008, p. 2A1). *A. microcymbus* has received some protections because of its sensitive status, including the establishment of the South Beaver Creek ACEC and limited money for survey and monitoring efforts. However, part of this ACEC is overlapped by the Hartman Rocks Recreation Area, which is resulting in some habitat loss, fragmentation, and degradation.

The Federal Land Policy and Management Act of 1976 mandates Federal land managers to develop and revise land use plans. The RMPs are the basis for all actions and authorizations involving BLM-administered lands and resources. They establish allowable resource uses, resource condition goals and objectives to be attained, program constraints and general management practices needed to attain the goals and objectives, general implementation sequences, and intervals and standards for monitoring and evaluating the plan to determine its effectiveness and the need for amendment or revision (43 CFR 1601.0-5(k)).

The RMPs provide a framework and programmatic guidance for activity plans, which are site-specific plans written to implement the RMP. Examples of activity plans include Allotment Management Plans that address livestock grazing, or other activity plans for oil and gas field development, travel management, and wildlife habitat management. Activity plan decisions normally require additional planning and National Environmental Policy Act (NEPA) analysis. The Gunnison Resource Area’s RMP represents an enforceable regulatory mechanism. *A. microcymbus* is not specifically protected in areas outside the South Beaver Creek ACEC within the RMP but is protected by the Special Status Species Management guidance and general RMP guidance for the management of special status plants (BLM 1992, pp. 1–13; 1993, p. 2.4). Public scoping for the next RMP for the Gunnison Resource Area is estimated to begin in 2011 (Japuntich 2010d, pers. comm.). We expect that existing protections for the species will remain in place for the next RMP, but cannot predict if additional protections for *Astragalus microcymbus* will be developed.

As discussed above in Recreation, Roads, and Trails, *Astragalus microcymbus* was included in the Gunnison Resource District’s RMP when the South Beaver Creek ACEC was designated. This area encompasses 60 percent of the *A. microcymbus* units (BLM 1993, pp. 2.29–2.30). The South Beaver Creek ACEC was designated specifically to protect and enhance existing *A. microcymbus* populations and habitat. Actions outlined for the South Beaver Creek ACEC, and their implementation, are included in Table 5 below.

TABLE 5. Actions identified, with notes on implementation, for *Astragalus microcymbus* in the South Beaver Creek ACEC in the 1993 Gunnison Resource Area’s RMP.

ACTION	IMPLEMENTATION
Monitoring to determine population trends	Being done regularly at 4 plots by DBG & intermittently at 4 plots by BLM
Actions to improve habitat conditions	Few - 2 trail closures, 1 reroute, cheatgrass control efforts
Minimization of surface disturbing conditions to protect species & its habitat	Some control of vehicles
Development of management plan for *Astragalus microcymbus*	Not implemented
No chemical spraying	Likely implemented
No vegetative treatments	Implemented
No additional forage allocations	Unknown, especially as related to deer & elk
Controlled surface use stipulation	Implemented
No conflicting erosion control measures	Implemented, unsure about water bars
No domestic sheep grazing	Implemented
Limit motorized vehicular traffic to designated routes	Implemented although enforcement is problematic
Public lands with *A. microcymbus* will not be disposed	Implemented
Acquisition of non-Federal lands if available	Not implemented
ROW permitted without direct impacts to *A. microcymbus*	Implemented
Wildfire suppression	No wildfires to-date

The South Beaver Creek ACEC has resulted in some protections for *Astragalus microcymbus*, specifically: Monitoring, two surveys, two trail closures, one trail reroute, and some restrictions to herbicide use and livestock grazing. These protections are an improvement over more generally managed BLM lands. However, 70 percent of the South Beaver Creek ACEC is within the Hartman Rocks Recreation Area, even though the South Beaver Creek ACEC was developed at least 8 years prior to the Hartman Rocks Recreation Area (BLM 2005a, p. 44). Numerous trails are also designated through *A. microcymbus* units (see Recreation, Roads, and Trails above). The designation of this Recreation Area overlaying *A. microcymbus* demonstrates that these ACEC protections are not adequate to protect the species.

All *Astragalus microcymbus* units on public land are within active livestock grazing allotments. The BLM regulatory authority for grazing management is provided at 43 CFR Part 4100 (Regulations on Grazing Administration Exclusive of Alaska). Livestock grazing permits and leases contain terms and conditions, determined by BLM to be appropriate to achieve management and resource condition objectives and to ensure that habitats are, or are making, significant progress toward being restored or maintained for BLM special status species (43 CFR 4180.1(d)). The State or regional standards for grazing administration must address habitat for endangered, threatened, proposed, candidate, or special status species, and habitat quality for native plant and animal populations and communities (43 CFR 4180.2(d)(4) and (5)). The guidelines must address restoring, maintaining, or enhancing habitats of BLM special status species to promote their conservation, as well as maintaining or promoting the physical and biological conditions to sustain native populations and communities (43 CFR 4180.2(e)(9) and (10). The BLM is required to take appropriate action not later than the start of the next grazing year upon determining that existing grazing practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines (43 CFR 4180.2(c)).

Livestock use specific to *Astragalus microcymbus* is discussed in further detail in Livestock, Deer, and Elk Use of Habitat above. Within the South Beaver Creek ACEC, no additional forage allocations will be made and domestic sheep grazing will not be authorized (BLM 2005a, pp. 2–29 to 2–30).

Despite management actions undertaken by BLM, grazing is impacting *Astragalus microcymbus* and its habitat. The BLM has no research or monitoring that specifically addresses the impacts to *A. microcymbus* or its habitat and the effects from ubiquitous livestock use. In addition, there is no research or monitoring that addresses how deer and elk utilization is being jointly considered (with livestock use) within the range of *A. microcymbus*. Therefore, we find the management of livestock, deer, and elk is not adequately addressing the threats discussed under "Livestock, Deer, and Elk Use of Habitat" above, and is therefore a threat to the species.

As discussed in "Recreation, Roads, and Trails" in Factor A above, based on the combination of the documented impacts resulting from recreational activities atop *Astragalus microcymbus* and its habitat and the designation of the Hartman Rock Recreation Area over the South Beaver Creek ACEC, we believe that existing Federal regulatory mechanisms are inadequate for protecting *A. microcymbus*. Management prescriptions or AUMs for livestock use are three to five times higher than current use levels. Because livestock impacts are occurring to *A. microcymbus* at current stocking rates, we expect if livestock were managed at these higher AUM levels, much more intense impacts would occur to the plant. In addition, the South Beaver Creek ACEC designation, while providing limited protection for *A. microcymbus*, was not adequate to preclude the designation of a recreation area in the same location (70 percent of the ACEC). We cannot say what will happen with *A. microcymbus* in the upcoming RMP revision, but if we consider conservation efforts since the last RMP revision, we expect *A. microcymbus* and its habitat will continue to decline in the foreseeable future. We find that Federal laws and regulations are currently inadequate to protect the species from being threatened or endangered.

Summary of Factor D

Twenty-five percent of *Astragalus microcymbus* habitat occurs on private lands with no regulatory protections. No State laws protect the species. On Federal lands, the species is managed as a sensitive species but this designation has not adequately protected the species. Over 40 percent of the *A. microcymbus* habitat and 70 percent of the South Beaver Creek ACEC lies within the federally managed Hartman Rocks Recreation Area, which serves to focus human use in this area, a designation that runs counter to the protection of the species. For these reasons, we find the existing regulatory mechanisms to be inadequate because of increasing recreation and development potential on private land. We find that *A. microcymbus* is threatened by the inadequacy of existing regulatory mechanisms now and these threats are expected to continue or increase in the foreseeable future.

E. Other natural or manmade factors affecting its continued existence:

Periodic Drought

Drought is a common occurrence within the range of *Astragalus microcymbus* (Braun 1998, p. 148; WRCC 2010c, p. 8). Infrequent, severe drought may cause local extinctions of annual forbs and grasses that have invaded stands of perennial species, and recolonization of these areas by native species may be slow (Tilman and El Haddi 1992, p. 263). Drought reduces vegetation cover (Milton et al. 1994, p. 75; Connelly *et al.* 2004, pp. 7–18), potentially resulting in increased soil erosion and subsequent reduced soil depths, decreased water infiltration, and reduced water storage capacity. Drought also can exacerbate other natural events such as defoliation of sagebrush by insects and the invasion of nonnative invasive plants. *A. microcymbus* responds negatively to declines in overall precipitation and periods of drought, as well as declines in spring precipitation (May and July) (DBG 2010a, p. 6). For example, during the drought of 2001 and 2002, *A.*

microcymbus populations declined precipitously (DBG 2010a, p. 6). Because periodic drought will likely continue and could increase (see Climate Change in Factor A above) and because of the decline in population numbers associated with drought, we find drought to be a threat to the species (recognizing the uncertainty with climate change models).

Small Populations

Small populations and species with limited distributions, like those of *Astragalus microcymbus*, are vulnerable to relatively minor environmental disturbances such as recreational impacts, nonnative plant invasions, and wildfire (Given 1994, pp. 66–67; Frankham 2005, pp. 135-136), and are subject to the loss of genetic diversity from genetic drift, the random loss of genes, and inbreeding (Ellstrand and Elam 1993, pp. 217–237; Leimu *et al.* 2006, pp. 942-952). Populations with lowered genetic diversity are more prone to local extinction (Barrett and Kohn 1991, pp. 4, 28). Smaller populations generally have lower genetic diversity, and lower genetic diversity may in turn lead to even smaller populations by decreasing the species’ ability to adapt, thereby increasing the probability of population extinction (Newman and Pilson 1997, p. 360; Palstra and Ruzzante 2008, pp. 3428-3447).

For plant populations that do not reproduce vegetatively, like *Astragalus microcymbus*, pollen exchange and seed dispersal are the only mechanisms for gene flow. Pollen dispersal is limited by the distance the pollinator can travel. Both pollen and seed dispersal can vary widely by species (Ellstrand 2003, p. 1164). We do not understand either pollen or seed dispersal capabilities for *A. microcymbus*. As our understanding of gene flow has improved, the distances scientists believe genes can travel also has increased (Ellstrand 2003, p. 1164). We believe that genetic exchange could be possible, although unlikely, between the Henry, Gold Basin Creek, and South Beaver Creek Units, and expect that genetic exchange does occur occasionally between the South Beaver Creek Units.

Most *Astragalus microcymbus* units comprise multiple sites with many individuals and genetic exchange should not be limited within units. However, two *A. microcymbus* units – Henry and Cebolla Creek – are located over 2.5 km (1.5 mi) away from any other units and have few individuals. For these two units in particular, small population size and a loss of genetic diversity may be a problem. Other *Astragalus* species with small populations have demonstrated lowered genetic diversity (Travis *et al.* 1996, pp. 735–745). The limited range of *A. microcymbus* makes the species more susceptible to being significantly impacted by stochastic (random) disturbances such as wildfire. Because stochastic threats such as wildfire are currently low, and because two *A. microcymbus* units are isolated and small, we find the overall effect from small populations to be low to the point where it is not a threat.

Summary of Factor E

Periodic drought is a threat to *Astragalus microcymbus*. We know that the species' abundance decreases during drought conditions, but we do not know how this influences long-term survivorship of the species, especially in light of climate change. We know the species has a limited distribution and two out of nine *A. microcymbus* units are small and isolated, but we do not understand how this is affecting the genetic diversity of the species nor do we consider small population size to be a threat. With such a limited range, the species is at risk from stochastic events but there is no way of predicting these events. Although there are many unknowns, we find the threat from periodic drought to be moderate at this time. Based on this, the overall threat from Factor E is low to moderate. We find that *A. microcymbus* is threatened by other natural or manmade factors affecting its continued existence now and these threats are expected to continue or increase in the foreseeable future.

Conservation Measures Planned or Implemented :

Conservation measures are discussed within the threat sections above. Specifically they include:

1) The BLM in conjunction with local groups is working to close, rehabilitate, and re-vegetate trails. Further trail restoration is planned and further trail closures may occur.
2) The BLM is hand pulling and spraying areas for nonnative invasive species, most commonly cheatgrass. Further control efforts are planned into the future.
3) The South Beaver Creek ACEC was designated by the BLM specifically to protect *Astragalus microcymbus*.
4) Demographic monitoring for *Astragalus microcymbus* has been conducted by DBG and the BLM since 1995.
5) Trend monitoring has been conducted by the BLM during 3 separate years to track *Astragalus microcymbus* abundance.

Summary of Threats :

Table 6 below provides an overview of the threats to *Astragalus microcymbus*. Of these threats, we consider recreation, roads, and trails, the overall inadequacy of existing regulatory mechanisms, and habitat fragmentation and degradation to be the most significant threats (Table 6). Recreational impacts are likely to increase given the close proximity of *A. microcymbus* to the town of Gunnison and the increasing popularity of mountain biking, motorcycling, and all-terrain vehicles. Furthermore, the Hartman Rocks Recreation Area draws users and contains over 40 percent of the *A. microcymbus* units. The overall threat from a lack of existing regulatory mechanisms is high given that 25 percent of the habitat has no protections and that Federal protections allowed a recreation area to be developed on the species' habitat. Recreation, as well as most of the other threats to *A. microcymbus*, leads to habitat fragmentation and degradation.

Moderate threats to *Astragalus microcymbus* include: residential and urban development; livestock, deer, and elk use; climate change; and increasing periodic drought. Of these, the threats facilitated by climate change are the most likely to increase in the future. In addition, we are particularly concerned about nonnative invasive plants, especially cheatgrass. Cheatgrass is expanding in the Gunnison Basin. Furthermore, the dry south-facing slopes where *A. microcymbus* is found are the warmest and, therefore, the most vulnerable to cheatgrass invasion in the Gunnison Basin.

Although wildfire is ranked as a low threat, this factor may increase in the future. Wildfire is likely to increase because of its link to nonnative invasive plants and habitat degradation. Small mammal herbivory, because of the significant effect to seed set, is considered a low to moderate threat. All other stressors to *Astragalus microcymbus* are currently regarded as impacts and not threats to the species' continued existence.

While we have considered all the threats here separately, many are interrelated. For example, many of these threats contribute to habitat degradation. Cheatgrass seldom spreads without some sort of disturbance. Wildfire frequency does not increase without more people to start the fires, more lightning, or increases in nonnative invasive plants (especially cheatgrass) and may be exacerbated by climate change. We find the overall threat to *Astragalus microcymbus* from all of these threats to be moderate.

TABLE 6. Threat summary for factors affecting *Astragalus microcymbus*.

Listing Factor	Threat or Impact	Scope of Threat or Impact	Intensity	Exposure (%)	Likelihood of Exposure	Species' Response	Foreseeable Future	Overall Threat
A	Residential & Urban Development	Moderate	Moderate	25	Moderate	Loss of habitat, loss of sites, pollinator impacts	Development within several decades	Moderate
A	Recreation, Roads, & Trails	High	High	15 (20-m buffer) to 46 (100-m buffer)	High	Loss of sites & habitat, habitat degradation, nonnatives, pollinator impacts	Significant increase (+20% annually) in users	High
A	Utility Corridors	Low	Low	4	Moderate	Loss of sites & habitat, habitat degradation	No immediate plans, limited in scope	None, impact only
A	Nonnative Invasive Plants	Low	Low+	0.1+	High	Competition, wildfire, pollinator impacts	Increasing with rapid increase possible	None, but increasing quickly
A	Wildfire	Low	None+	None but nearby	Low+	Nonnatives, species' response to wildfire unknown	Difficult to estimate, will relate to cheatgrass invasion	Low+
A	Contour Plowing & Nonnative Seedings	Low	Low	1.2	Low	Presumable loss, habitat degradation, pollinator impacts	Future seedings unlikely	None, impact only
A	Livestock, Deer, & Elk Use of Habitat	Moderate	Low to Moderate	95+	Moderate	Habitat Degradation, trampling, pollinator impacts	Permitted AUMs would increase impacts, deer & elk impacts could increase	Moderate
A	Mining; Oil & Gas Leasing	Low	Low	none	Low	Loss if mining occurred	Little activity, unlikely in the foreseeable future	None+
A	Climate Change	Moderate?	Moderate?	100	Moderate	Unknown but would likely cause a decline	Climate models predict 40-year changes	Moderate?
A	Habitat Fragmentation & Degradation	High	Low	100	High	Habitat degradation, genetic isolation	A byproduct of other threats	High
B	None						not likely to change	None

C	Small Mammal Herbivory	Moderate	Moderate+	~80, likely varies by year	High	Affecting seed set	Likely to continue & fluctuate with herbivore population	Low to Moderate
C	Deer & Elk Herbivory	Low	Low	winter	Low	Minimal, could affect seed set	Winter use makes herbivory less likely	None+
C	Livestock Herbivory	Low	Low	occasional	Low	Could affect seed set	Steep slopes makes herbivory less likely	None
C	Insect Herbivory	Low	Low	3	Moderate	Could affect seed set	No measureable impact	None
C	Disease	Low	Low	trace	Low	Death?	Rare	None
D	Inadequate Regulatory Mechanisms	Moderate	Moderate	100	Moderate+	Loss of habitat, loss of sites, pollinator impacts, influenced by management actions	Continued course will trend downward	Moderate
E	Periodic Drought	Moderate	Moderate	100	High	Decline	Climate change models predict increasing drought	Moderate
E	Small Populations	Low	Low	7	Low	Loss of genetic diversity	Increase if wildfires & cheatgrass increase	None, impact only

Listing factors include: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.
+ indicates a possible increase in the future
? indicates significant uncertainty

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

We provide the following recommended conservation measures to protect *Astragalus microcymbus*.

1) Expand monitoring so we can understand if the declining trends apply across the species range. Work toward stable or increasing trends (BLM, DBG, FWS).

2) Develop a team of interested individuals to guide conservation efforts for the species (FWS with others).
3) Conduct further surveys for the species (BLM, CNHP, FWS, DBG, and others).
4) Conduct outreach and education activities to protect *Astragalus microcymbus* (all).
5) During a good seed year, collect seed to develop a seed bank (DBG and others).

Listing/Recovery Factor A: The present or threatened destruction, modification, or curtailment of its habitat or range
6) Recreation - Consider removing or changing the boundaries of the Hartman Rocks Recreation Area to avoid *Astragalus microcymbus* and to prevent people from being drawn to these areas (BLM).
7) Recreation - Continue with trail and road closures and rehabilitations efforts to protect Astragalus *microcymbus*. Consider increased enforcement of closures and further signage (BLM, local user groups, FWS).
8) Nonnative Invasive Plants - Continue nonnative invasive plant species control and carefully monitor the spread of cheatgrass in the Gunnison Basin (BLM, FWS, and researchers).
9) Residential and Urban Development - Pursue conservation easements and other permanent protections for *Astragalus microcymbus* on private lands (all).
10) Ungulate Use and Herbivory - Conduct research to better understand the impacts of grazing and ungulate use to *Astragalus microcymbus* (BLM, FWS, and researchers).
11) Climate Change - Conduct research to better understand the impacts of climate change to *Astragalus microcymbus* (BLM, FWS, and researchers).

Listing/Recovery Factor D: The Inadequacy of Existing Regulatory Mechanisms
11) Implement the management guidelines prescribed for the South Beaver Creek ACEC (BLM).
12) Develop further management guidelines and a management plan to address threats, especially from recreation, to *Astragalus microcymbus* (BLM).
13) Consider removing or changing the boundaries of the Hartman Rocks Recreation Area to avoid *Astragalus microcymbus* and to prevent people from being drawn to these areas (BLM).

14) Pursue conservation for *Astragalus microcymbus* on private lands (all).

Priority Table

Magnitude	Immediacy	Taxonmomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	**Imminent**	Monotypic genus	7
		Species	**8**
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

Moderate. Table 6 above provides an overview of the threats to *Astragalus microcymbus*. Of these threats, we consider recreation, roads, and trails, the overall inadequacy of existing regulatory mechanisms, and habitat fragmentation and degradation to be the most significant threats (Table 6). Recreational impacts are likely to increase given the close proximity of *A. microcymbus* to the town of Gunnison and the increasing popularity of mountain biking, motorcycling, and all-terrain vehicles. Furthermore, the Hartman Rocks Recreation Area draws users and contains over 40 percent of the *A. microcymbus* units. The overall threat from a lack of existing regulatory mechanisms is high given that 25 percent of the habitat has no protections and that Federal protections allowed a recreation area to be developed on the species' habitat. Recreation, as well as most of the other threats to *A. microcymbus*, leads to habitat fragmentation and degradation.

We consider the threats that *Astragalus microcymbus* faces to be moderate in magnitude because the major threats (recreation, roads, and trails; inadequacy of existing regulatory mechanisms; and habitat fragmentation and degradation) while serious and occurring rangewide, do not collectively rise to the level of high magnitude. For example, the last known populations are not about to be completely lost to development.

Imminence :

We consider the threats imminent because we have factual information that the threats are identifiable and that the species is currently facing them in many portions of its range. These actual, identifiable threats are covered in great detail in Factors A, C, D, and E of this species assessment. Almost all of the threats are ongoing and, therefore, are imminent, although the likelihood of each threat affectin g the species varies (Table 6). In addition to their current existence, we expect these threats to continue and likely intensify in the foreseeable future.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

We believe there are enough populations of *Astragalus microcymbus* and the threats are not so immediate of of high enough magnitude to warrant emergency listing.

Description of Monitoring:

Monitoring efforts including annual surveys, monitoring being done by the BLM, and demographic monitoring being done by DBG is summarized under “Population Estimates/Status” above.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Colorado

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

We have coordinated with the State of Colorado (the only state where the species resides) through the Colorado Natural Areas Program.

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Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: Noreen E Walsh — 05/31/2011 Date

Concur: Gregory E Siekaniec — 10/07/2011 Date

Did not concur: ____________________ ________

Date

Director's Remarks: